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ORGANISATION.

IN those far-off days before the war, when we were discussing the respective strengths of British and Teutonic electrical manufacturing concerns, we were over and over again advised by those who are entitled to be described as leaders and experts in the industrial world that, if we were weaker than we ought to have been in certain departments, it was almost entirely due to want of organisation. We heard that statement in public speech and in private conversation; it was made in the technical and trade Press by editors and by their correspondents. Everybody seemed to be convinced that something along that line was needed, whatever other measures might be taken in our manufacturing interests. Attempts were, therefore, made to bring about that very desirable state of things when the electrical lion and the lamb would lie down together, when tangled skeins should be unravelled, when without the adoption of too harsh procedure manufacturers would sink as far as practicable their individual interests and adopt a uniform policy in matters of principle so that benefits might be secured for the whole of our national electrical industries. Nobody will say to-day that those attempts entirely failed, but for a variety of reasons they were never crowned with that measure of success for which some people hoped. They were, however, sufficiently successful to lead those interested in them to indulge in war-time in an appeal to all engineering industries to emulate their example, perhaps join hands with them, and thus pursue the same or similar good efforts in the direction of larger and more general national organisation. In the days of peace, propaganda meetings were held in some of the industrial centres, and a number of engineering firms were entered as members of one organisation. And now, while the war is at its height, others are embarking upon a somewhat similar series of propaganda meetings in provincial centres after holding two or three to create the right atmosphere in the metropolis. In addition to this, we have an elaborate Manchester proposal for roping in every engineering firm in the Kingdom, and an Institute of Industry which desires to secure the support of all branches of manufacturing. Yet further efforts are being made by others to establish organisations which are in some way or other to save the situation for us or assist us "after the war."

We profoundly hope that the cry for more efficient organisation, started long years ago and then so slightingly regarded, will in these times be taken up from one end of the land to the other, and will be rewarded with a fuller measure of success. But surely nobody anticipates that every firm will be induced to join hands in an engineering organisation! There always will be a number who will desire to "gang their ain gait," and it is for them to choose. There is, however, strong ground for hoping that there will soon exist amongst us an organisation which, while it may not include everybody, and while it may have little room for those who are inclined to give only a half-hearted support to true British interests, will be able to exert such an influence as shall both make it a power in Government circles and render it capable of conducting the most thorough-going campaign in Colonial and foreign markets for the benefit of British electrical and engineering industries.

Where is that organisation to be found?

We do not know what measure of success has attended the steps taken by the B.E.A.M.A. towards securing the already suggested "Federation of All Associations," which it apparently regards as being essential if the Ministry of Commerce, when we get it, is to be of the fullest service. Probably it is considered that public opinion must first be cultivated before that idea of federation can be developed. If that be so, there is no time to be lost. We may even be allowed to express a regret that steps of the kind were not taken in those early days after the outbreak of war, when we were led to suppose that the situation demanded no unusual effort. However, the present policy has been gradually developed, and as we go to press we learn that the Secretary has written a book which is shortly to appear, and in which he outlines a scheme for federation.

Very fittingly Birmingham was chosen (Manchester will not mind! Birmingham is nearer to London) as the place for the first of a series of meetings organised by the B.E.A.M.A. with the object of providing a platform for the general expression of opinion by the engineering industry on the public importance of that industry "as affecting the restoration of commercial prosperity and the maintenance of impregnable national defence after the war." It was made clear that the views expressed by those taking part in the discussion were not necessarily those of the B.E.A.M.A., that association merely undertaking the duty of organising the gathering. Now after all that has been written and said about the war and the engineering industries, and the economic struggle that is expected to follow the war, it must not be expected that many things new or original will be spoken on such public occasions, though there are many things that have to be said over and over again if public opinion is to be formed or guided. Was it not so at the last B.E.A.M.A. meeting in London? It is not surprising, therefore, to find that many of the old things were reiterated at Birmingham. They had to be—what else was there to say? If we were to report the discussion we should have to place before our readers once more many things that we have urged for many years in regard to the measures that the engineering industries ought to take for themselves. How long is it, for instance, since we urged that, without engineers in Parliament, engineering could not have its interests properly watched over at St. Stephens? How often have we stated that our foreign rivals, whether German or trans-Atlantic, had a great advantage over us by reason of the largeness of their output? How many times has the Ministry of Commerce been shown to be a necessity if Parliament and Government departments are to be able to understand what is injurious and what is beneficial to our industries? How often has the danger of our past reliance—almost complete in certain cases—upon Germany and Austria for certain manufactures been pointed to and held up as a grave warning? How often, almost to the point of weariness, have we all seen how desirable it is that good relations between Capital and Labour should be fostered, instead of the politician being allowed to sway the public with his efforts to set class against class? Yet all of these, and a score of other matters, form perfectly legitimate subjects for discussion in connection with the present propaganda efforts.

Surely to-day hardly anybody is ignorant concerning the supreme position that engineering has occupied in assisting the cause of the Allies during the past twelve months. Will this be forgotten by the nation after the war? Or will the industry be allowed to occupy that exalted place in the councils of the State which is its due? If only the nation can be led to see that by safeguarding the best interests of the engineering industry, the interests of the British Empire are being protected and strengthened, these conferences will not have been held in vain. In order that such may be the issue a federation of organisations seems desirable, if such federation is the best or only means of keeping so serious a matter lastingly before the mind of the voting public and of the elected politicians.

By effecting a better organisation of the British engineering industries, whether along Manchester, Birmingham, or Kingsway lines, if we act in time we shall be prepared to utilise our greatly enlarged manufacturing capacity and employ both those who return from the Front to these trades, as well as the many thousands of at present partly skilled workers, who will by that time probably rank in a class of higher efficiency, adaptable to work which, though it will not be on the production of shells, will still be of an engineering or metal-working character. The opener of the discussion said that we "must make the biggest effort ever recorded in industrial reorganisation," or "we shall have the biggest national scrap-heap ever witnessed." Of course, we have to remember that the words were those of Mr. Elder, not those of the B.E.A.M.A., that they were spoken at Birmingham, and that under these circumstances they will be none the worse for being taken *cum grano salis*. Those present were informed that the great problem of the future is not a manufacturing problem but a financial one. "What we shall be short of is working capital," but if we are short thereof, our enemies will assuredly be shorter. There will be plenty of work to do, but throughout the world there will be a limitation of purchasing power. "Finance alone can open the market gates and bring together the manufacturer and the user of machinery," all of which leads us on to those very familiar points that greater financial strength can be exerted by manufacturers who act in association than by single firms who, as we say, "gang their ain gait." "Our manufacturers should exploit foreign markets, not in a spirit of mutual rivalry, but in strong combination." This is as unquestionably true as it is hoary-headed. We trust that by means of a strong organisation it may become possible to make arrangements for industrial finance within industry itself, by means of "additional institutions" such as Mr. Runciman and his rejected sub-committee advocated. That certainly seems to be more within the range of practical politics than a conversion of our present sound and prosperous banking system which has so well stood the test of the strain of world-war. It was stated at Birmingham by Mr. Dudley Docker, who presided, that firms who deserved advances from the joint stock banks got them, but he added that the facilities might be multiplied by an adaptation of the German system, which combination among our manufacturers would make possible. It will be waste of breath to continue abusing our present banking system generally—we should be more profitably employed in working out our own salvation and forming our own "additional institutions" as the result of strong co-operative manufacturing action. It would probably be desirable to secure the co-operation of the banking interests, and some writers are advocating Government pressure to attain that end. We doubt whether much is to be gained either by such advocacy or by enforced co-operation.

Gas on Trains. The recent accident on Tyneside has once more directed public attention to the risks involved by the use of cylinders of compressed gas on railway trains, and has led to a good deal of correspondence and editorial reference in the pages of the lay Press. Unfortunately, the upshot is invariably the same—the matter drifts back into oblivion, until the recurrence of disaster stimulates public interest anew and calls forth a fresh crop of letters and articles. The difficulty at the root of the trouble is a financial one; much capital has been sunk in equipping railway trains with gas-lighting

installations, and in providing gas generating and charging stations, and the railway companies cannot see their way to abandon this expenditure and spend fresh capital on electric lighting plant. The stringency of capital that will be experienced after the war will further retard reform. That the authorities recognise the danger is clearly proved by the fact that many of the railways are installing electricity in preference to gas on all new rolling stock, but many years must elapse before the obsolescence of their existing stock brings about anything like the complete abolition of gas lighting.

An article in a financial contemporary last week quoted "an expert of over 30 years' standing," to the effect that serious accidents resulting in loss of life by the use of gas practically never occur to comparatively slow trains, the impact being insufficient to smash up the carriages and demolish the gas cylinders; hence he concludes that only in the case of expresses need provision be made to avoid such occurrences.

That so short-sighted a view should be held is somewhat extraordinary. Surely it is obvious that if a fast train crashes into a slow train, the latter being equipped with gas, the danger is just as great as if the fast train were gas-lighted—even greater; for expresses usually consist of stronger and heavier coaches than slow trains, and are less likely to suffer destruction than the lighter rolling stock employed for slow traffic.

The expert suggests that the gas cylinders should be carried only under the last carriage of a train, whence the whole train would be supplied with gas, and here, again, it is obvious that the rearmost coach of a standing train is the very one most exposed to the impact of a following train. Such arguments are too transparently fallacious to carry any weight.

Rubber.

There has been irregularity of movement in the crude rubber market, but prices have registered an advance on balance, the improvement in sentiment being due, to some extent, to the presence at sea of at least one German raider. The rubber trade has not forgotten the consequences of allowing the *Emden* a free hand for so long, and is highly apprehensive regarding the possible exploits of the *Moewe*. There has been a very good demand from consumers both on home trade and on export account, Russia being particularly well to the front in the latter connection. The quantities of material reaching here of late have been comparatively light, but there is a moderate premium still for deliveries this side of June, and this feature will, no doubt, become accentuated if the German raider sets to work in earnest as the *Emden* did. One of the features which have been especially pronounced in the market within the past month has been the improvement in the demand which has been experienced for the lower grades of plantation material, the result of which has been that the margin between the finer and the poorer sorts has been reduced to a considerable extent. There is hardly any improvement in the shipping position owing to the congestion at the docks, and whenever there is any little quickening in demand, prices respond immediately. Lately there has been more disposition on the part of Brazilian holders to market material, and this recently caused a very sharp break in the price of fine hard Para, but the market has since steadied.

There is no doubt that the English market is losing its importance as the world's distributing centre, for all the statistics available here and in the nearer East are indicative of the greatly increasing importance of the quantities shipped direct from there to America. An official cablegram received from Singapore gives the amount of plantation rubber exported from the Straits Settlements for the month of January as 4,443 tons, compared with 3,005 tons in December last, and 2,576 tons in the corresponding period of last year. These figures include transhipments of rubber from various places in the neighbourhood of the Straits Settlements, such as Borneo, Java, Sumatra, and the non-Federated Malay States, as well as rubber actually exported from the Colony, but do not include rubber exports from the Federated Malay States.

Trade Union Rules.

A singular example of the way in which the rules of Trade Unions are sometimes sought to be applied is to be found in the case of Kelly *v.* National Society of Operative Printers, which was fully reported in a recent number of the *Law Times Reports*. The plaintiff, a printers' assistant, was a member of the defendant society in 1913, and was employed in the machine room from 10.30 p.m. to 6.30 a.m. During the day time he worked for several hours each day for a firm of carriers, unknown to his employers at the printing office and to the officials of his society. As stated by Lord Justice Swinfen Eady in his judgment: "He is 43 years of age. He said that he did not find the work of a reel hand heavy; he has two children, and a wife who is unfortunately a cripple; and for their sake he worked as he did." On his daily activities becoming known to the society, a resolution was passed for his expulsion. The resolution purported to be made under a rule of the society enabling a branch committee to expel a member for "misconduct calculated to damage the character and reputation of the society." The act of misconduct alleged against the plaintiff was not specifically mentioned in the rules; but another Rule 29 (2) provided as to the amount of overtime which night men were allowed to work. He brought an action in the County Court and obtained a declaration that the resolution was *ultra vires* and void, and an injunction with damages for £68. The defendant appealed on the ground that the society was unlawful as being in restraint of trade, and that the action was brought on an agreement and non-enforceable by statute. The Divisional Court was divided in opinion; in the Court of Appeal, however, all three judges held that the plaintiff having been expelled under a rule which gave no power to expel, and in respect of an offence which he had never committed, was entitled to the injunction claimed. It was, however, held that he could not recover any damages; but he was allowed the costs of the entire proceedings. This decision appears to us to accord with the first principles of justice. In effect, the Union sought to alter its rules in order to meet a particular case; but it has long been a principle of English law that no club or society can alter its rules so as to expel one of its members against the wishes of the minority. It may be hoped that the lesson of this case will not be forgotten.

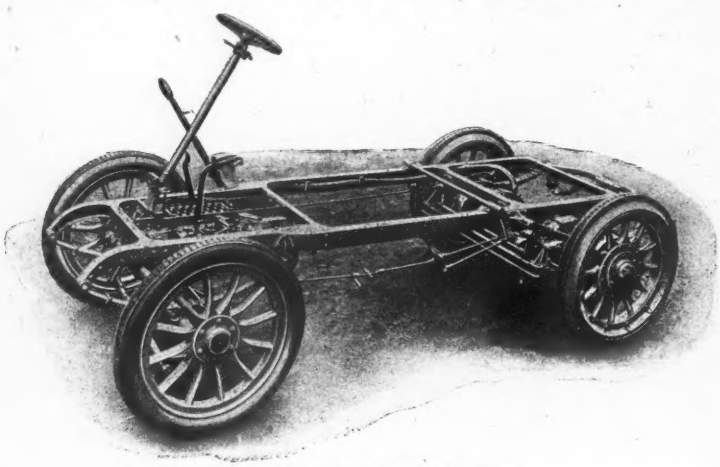
Engineers and Economics.

Elsewhere in this issue will be found the announcement that the Council of the Institution of Civil Engineers has invited a noted economist to address the members on the subject of "Industrial Development," feeling that engineers should give earnest attention to the economic issues which, after the war, must profoundly influence the future of engineering, and the industrial and commercial enterprises which are vital to its progress. We cannot too cordially welcome this indication that the Council of our leading engineering Institution is alive to the importance of this aspect of the gigantic struggle which is now in progress.

Hitherto our engineering institutions have held aloof from the great questions which have racked the nation, refusing to "dabble in politics," and ignoring the fact that politics—the art of government—is the highest interest of the citizen. Not *party* politics—for that odious profession we have nothing but contempt; they have done well to keep their hands unsoiled by such contamination, but they would do better if, without neglecting the scientific and technical aspects of their work, they would recognise the duty that is laid upon them to discuss with calmness and discernment the great political questions which properly lie within their scope. Amongst these are the industrial, economic, and commercial problems which arise from time to time, and which at the present juncture have assumed new forms, and have become of the utmost urgency. We commend the excellent example of the civil engineers to the consideration of the Council of the Institution of Electrical Engineers, which in the past has shown a regrettable disposition to stigmatise such matters as sordid and unworthy of its attention.

ELECTROMOBILE BATTERY CARS.

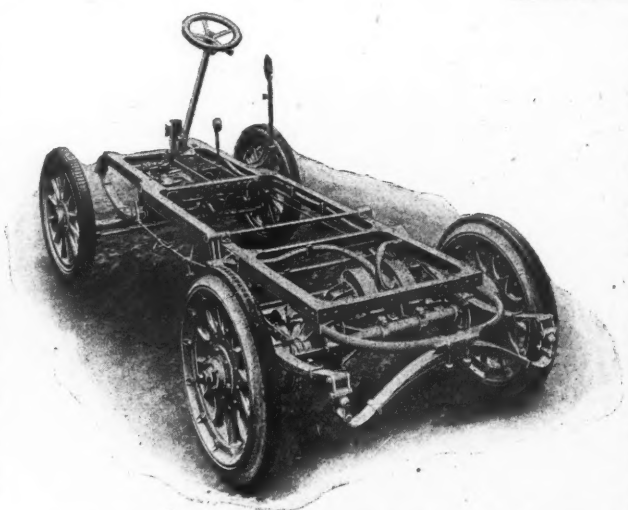
On the occasion of the official inauguration of the Swansea electricity department's new showrooms, a feature of particular interest was the electric saloon car in which the Mayor, Chairman and Vice-Chairman of the Electricity Committee drove to the ceremony, it being, we understand, the first electric battery car in Wales.



The Electromobile Chassis.

This car was lent for the occasion by Messrs. Johnson and Burgess, Ltd., the Swansea representatives of Messrs. Electromobile (Leeds), Ltd., who, we understand, built the car to the special requirements of Messrs. Johnson & Burgess, Ltd.

It may be added that many refinements have been incorporated, and the vehicle is considered, both in its technical features and in appearance, an advance on American designs.



Rear view of Chassis, showing arrangement of Motor, Gearing, &c.

It is fitted with an "inside drive" saloon body for four persons, collapsible swivelling seats being provided for the driver and his companion; the body is painted in Vauxhall brown and black, and upholstered in Bedford cloth.

The chassis is built up of pressed steel members, and is fitted with semi-elliptical springs, and wheels with Warland rims; it has a wheel base of 7 ft. 6 in., and a tread of 4 ft. 6 in.

The electrical equipment consists of an 8-B.H.P. double commutator series-wound totally-enclosed motor, running at 1,600 R.P.M.; this has a direct drive on to the differential on the rear axle, through double helical machine-cut gears.

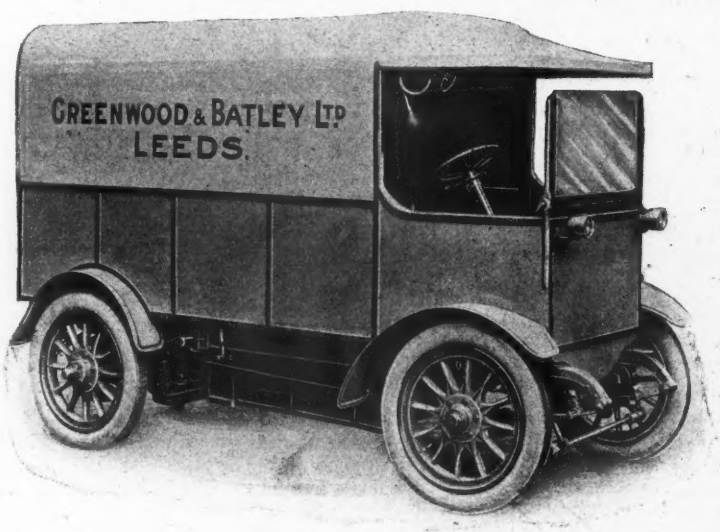
The battery slung under the chassis consists of 44 Chloride super-Exide type cells; each cell has 15 plates with wood separators, and weighs 32½ lb. only. A special feature is the large sediment space at the bottom—3¼ in. instead of the usual ¾ in.—as a result of which there is no need to clean out the battery until the end of the life of the plates, instead of every thousand miles or so. The battery has an output of 165 ampere-hours, or sufficient for 50 miles running on one charge.

The electrical control of the vehicle is by means of a combined foot pedal main switch (with magnetic blow-out) and starting resistance—the arrangement being quite novel and particularly designed to facilitate driving in traffic where frequent and sudden speed reductions are wanted. The switch-arm coupled to the pedal is normally held in the full-load position by spring tension; a partial depression of the pedal gives the equivalent of "clutch slipping" for a momentary slowing up, and a full depression of the pedal cuts off current from the main controller, which can then be moved without sparking to any desired speed notch.

The driver can, of course, move the controller to the highest speed position to commence with, and start by the pedal, but this extremely rapid acceleration is not recommended, although it can be accomplished without any perceptible jerk.

It may be added that the resistance employed is of the carbon disk compression type, consisting of Ferranti tubular resistance units.

Speeds are selected by a control handle mounted concentrically with the steering wheel, and in this connection we may mention the electric horn switch of the Seng type, also a novelty in its way. This consists of a metal ring mounted underneath and concentrically with the steering wheel; when the ring is touched by the fingers at any point the horn is immediately operated. This is a great improvement in a small but important detail, as the driver can sound the horn without moving his hand or eye from their driving positions. Further, the electric wiring is fixed in one stationary position, and does not get twisted round the steering pillar, as is the case with a switch mounted in the usual way on an arm of the steering wheel. A polished



Electromobile Delivery Van.

mahogany instrument dashboard is fitted, on which are lamp switches—for a Holophane roof light, a rear lamp, and two head and two side lamps—a flush Stewart speedometer, a flush Stewart rim-winding clock, the latest pattern Weston volt-ammeter incorporating a miniature electric lamp and a Sangamo ampere-hour meter of the differential shunt type with a reversible pointer and automatic cut-off, for disconnecting the circuit when the battery is fully charged without the necessity of an attendant standing by to switch off.

It should be mentioned that ball bearings are fitted throughout. Three brakes are fitted, operated by foot, hand and electrically, by using the motor as a dynamo short circuited through a resistance. Sufficient has been said to indicate that the Swansea car lacks nothing in up-to-date equipment; in normal running, it may be added, that it operates on $\frac{1}{4}$ to $\frac{1}{3}$ unit per mile.

Through the courtesy of the makers, Messrs. Electromobile (Leeds), Ltd., we are able to illustrate a delivery van which they supplied to Messrs. Greenwood & Batley, of Leeds, last year. This has a light canvas-covered body, and carries 12 to 15 cwt. of goods, the speed being from 13 to 14 miles an hour. This vehicle was originally intended for carrying between different local works, representing very short journeys indeed, but its handiness was so apparent, that its radius of action has now been extended to places seven or eight miles distant.

The general constructional features of the Electromobile chassis will be gathered from the early part of this article and from the views of the chassis; the delivery van is equipped with an 11-plate type "Exide" 40-cell battery, giving 40 miles' travel on one charge, and with electrical control similar to that already mentioned.

ELECTRICAL TRADE AFTER THE WAR.

At a recent meeting of the British Westinghouse Club, Mr. G. H. Nelson, A.M.I.E.E., assistant superintendent of the Electrical Machines Department, read a paper on the advancement of British electrical industry after the war. He prefaced his remarks by a reference to the fact that the United States had realised the necessity of taking immediate steps to obtain a large share of the trade of the world, and was spending money freely on research work. The first thing for us to do was to win the war, and each one might help towards this end by making economies in living, avoiding imported luxuries, limiting as far as possible all necessities that came from neutral States, and investing the money saved in war loans. In business every effort should be made to produce as quickly as possible, at a minimum cost, all the requirements for running the war, and to employ men ineligible for the firing line.

The "Business as usual" campaign had been a mistake; our policy should have been to prosecute the war to a successful issue without delay. However, that phase had passed, and the German commercial section considered that the military party had made a great mistake, for nearly half Germany's export trade before the war was with this country and our Allies. Many weaknesses must be eliminated from our manufacturing and selling methods before we could even get level with Germany in many of our industries. Our enemies were already preparing for the problems of peace. Our exports at present made a good showing in pounds sterling, but a great deal of these would go to help win the war, and would not serve to develop our export trade. America and Japan were establishing their export trade while we were unable to compete, and no time should be lost in making preparations for the future.

The author gave a mass of statistics with regard to German electrical trade, showing that in the period 1907-1911 the number of concerns increased 41 per cent., and the number of hands employed 80 per cent.; the total earnings of employés increased 73 per cent., and the wages per employé 3¼ per cent. No other industry showed so great a development. German electrical exports were valued at 7.7 millions sterling, ours at only 3.1 millions, and their electrical goods were sound and of high efficiency; they had established themselves in countries, such as Russia and Spain, where we competed with them on equal terms, and did more than their share of the trade with our Colonies. The white population of the British Empire was slightly less than that of Germany, but we had a total population of 400 millions, which should afford us an immense scope for trade, in addition to that with foreign countries.

The great progress of the Germans in commerce was ascribed by the author to careful manufacturing organisation and research work; technical education; selling organisation; their banking system; and import duties which secured to them their home markets.

Manufacturing organisation dealt with factory expenses and the design of products. As regarded factory expenses, the Germans ran their works night and day, and this had an important bearing on the subject. Factory expenses were made up of rents, rates, taxes, maintenance and depreciation of buildings and machinery, power, light, engineering, draughting, management, purchasing and accounting expenses, salaries of foremen and charge hands, and miscellaneous shop labour. Productive expenses, on the other hand, represented the cost of the workmen's time.

The selling price of an article was made up of the cost of material and labour (which could be easily determined), share of factory expenses and of selling expenses, which were not easily arrived at, and profit. The author showed that where an annual output of 1,000 motors would bring in a profit, a reduction of output by 50 per cent. would probably show a heavy loss, due to the fact that factory and selling expenses did not diminish correspondingly; further, if the output were doubled by working day and night, the profit would be very greatly increased. Hence, keeping down the factory expenses per article and securing the maximum output were considerations of the first importance. He declared that night working paid handsomely in the electrical industry, which carried such large overhead charges—but it was essential to success that the night shift should be run on the same lines as the day shift as regarded facilities for getting the work done. Moreover, the extra output could be profitably sold at reduced prices, thus enabling the makers to establish themselves in foreign markets. The greater proportion of repetition work with larger output also enabled the costs of production to be reduced.

The importance of good design had been fully appreciated by the Germans, who gave great attention to this subject. The most important question was—what did the customers want? Information under this head could be obtained from the selling organisation and erecting staff; these should keep accurate records of the machines sold, their load and speed, the nature of their work, and the conditions of running. The German was not content to rely on the ideas of one man in getting out, say, a new motor; he collected all the available information, including particulars of competing machines, the results of scientific investigations, the views of the heads of departments, and so on, and from this combination evolved a motor better than that of any competitor. It embodied the best of these men's ideas and experience, and the results of an enormous amount of research work on materials to aid the designer to secure the maximum output for minimum weight. The co-operation of all departments of the factory in this work was of the greatest importance. In this country there was not the slightest doubt that designs generally were not tackled on a thorough basis, and in consequence many designs were developed that the salesman could not sell or the shopman build.

The author gave some comparisons between British and German motors. The shafts of the latter had fewer diameters than those of the former. A 2-H.P. machine of German make had a main coil weighing 8¼ lb., and a commutating coil weighing 4½ lb.; a similar British machine had a field coil weighing only 10 lb. The German coil was nicely shaped and better impregnated. A small German motor of 130 lb. weight, running at 1,200 R.P.M., had an output of 2 H.P.; a British machine of the same weight and speed, an output of 1½ H.P. The British machine had no fan or commutating poles, and even if a fan had been fitted, the maximum output could not have been obtained without commutating poles; the German machine had both, its armature had larger slots and contained more copper—there was nearly twice as much copper in the German slot as in the British.

To bring the latter into line with the former, the makers had to fit a fan, wind the coils tighter, and get more copper on the armature. All this was done on an existing frame, but while making changes to fit a fan the machine was made so that the brackets at each end were alike. This was a point in advance of the German design, representing a saving of 15 per cent. on the building of 100 motors.

The author pointed out that an enormous amount of money was spent on experimental and research work of one kind and another, but it was not carried on in an organised fashion. He considered that there should be in London, or in some other centre, an experimental and research bureau, to which results of experiments were sent and recorded; to this bureau any firm could refer for information before commencing to carry out tests, and this information would be sent free of charge. The maintenance of this bureau should be covered by the State, as by circulating the results of research work the trade of the country must benefit. Similarly, many manufacturers should be educated to look at the matter exactly in the same way, namely, that by publishing the results of their researches they were benefiting the trade of the country, and, therefore, they personally must be benefiting in a proportionate degree.

Much of our own business was snatched from under our noses. For example, the Buenos Aires tramway undertaking was started by British capital, and electrified by German; similarly, the Victoria Falls power scheme contract went to Germany, as well as the orders of some of our great railways and corporations. Twenty years ago we practically mono-

polised the Russian market, but previously to the war we were overtaken by Germany, because with our over-conservative methods of business we were not inclined to allow long credits, we would not quote in the weights and measures of the country, nor would we quote for goods delivered at the frontier, duty paid. We should study the requirements and financial methods of the country, deal in the business methods of the country, with men who were familiar with the people, their language, and their ways, deal in the units of weight and measure of the country, and correspond in the language of the country.

The German's home trade was secured to them by protective tariffs and the patriotism of the nation. The German Government, corporations, and railways would not give an order to Britain because the British price was less than the German, even if the British firm cut the price to get in. This could not be said of British corporations. Further, some of our big industrial firms did not consider one another. A special line was got out by one of our hosiery manufacturers. The samples were sent to a leading merchant house, and the line sold well. One day a traveller from a German house came in with samples, but was told his samples were not up to the English makers' standard. The German asked for a sample of the British make, and was given one. This was sent to Germany, duplicated, and offered to the English merchant at 10 per cent. less than the British makers' price, without actually giving the figure, and the English house gave the Germans an order.

Another case happened with himself. He had put an electrical installation in one of our big industrial places, costing upwards of £10,000. On completion it was found that a certain section of the works wanted lighting, and he was asked to get out a scheme and submit a tender. This was done; the tender included the supply of three small transformers and carrying out the necessary wiring, the whole costing about £700. He received the order for wiring, but not for the transformers. The wiring was completed, and the transformers arrived and had to be installed by the purchaser. The author was sent for the day after, and the manager told him the transformers were wrong and would not give proper voltage at lighting points. When asked what that had to do with the author, he coolly replied: "Well, I took your specification from your tender, and Bergmans' supplied the transformers on that specification."

Mr. Nelson concluded by remarking that we were a race that suffered from inertia, but, like all bodies that had big inertia, we should show that when we got on the move we took a lot of stopping. We should start by stirring up patriotism for our own products instead of installing foreign-made goods, and by adapting the German "ten commandments," which urged the reader in all things to study German interests, to our own case by substituting England for Germany.

AN ENCLOSED CADMIUM-VAPOUR ARC LAMP.

The following particulars of this new lamp are taken from the paper read before the Physical Society by Dr. H. J. S. Sand:—Lowry and Abram give an account of an enclosed cadmium-arc lamp designed to supply the cadmium lines only; the employment of this lamp was, however, not very convenient, as it had to be left permanently connected with an air pump. It was started by an electric spark and was run at a low temperature, being water-jacketed, but, even so, its life was not long.

The lamp which the author has constructed is run at a fairly high temperature, the metal being melted by means of a Bunsen burner before starting, so that the arc may be struck by tilting; and the temperature of the lamp is maintained high enough to keep the metal in a molten condition and to prevent condensation of metal vapour on the glass.

The principal difficulties to be overcome consisted in the removal of dissolved gases and oxide from the metal and in preventing it from adhering to the glass, which would lead to fracture of the lamp on heating and cooling. As the lamp is constructed of quartz glass, there was also the difficulty of obtaining an efficient vacuum-tight seal for the leading-in wires, but this difficulty was overcome in a perfectly satisfactory manner by the lead seals described about two years ago.*

The oxide and dissolved gases are removed by subjecting the metal to a process of filtration in a vacuum during introduction into the lamp. The adherence to the glass, which would be very great in the case of a metal freed from its coating of solid oxide, is overcome by introducing into the lamp a small amount of a fine powder which spreads itself out over the surface of the metal. The powder chosen for this purpose was always zirconia, obtained by igniting zirconium nitrate.

Fig. 1 shows the general appearance of the lamp. It consists of a quartz tube bent into an inverted U in such a manner as to give rise to a short cathode chamber A and a long anode chamber B. Each of these chambers is continued in a leg consisting of a thick-walled capillary through which a tungsten wire passes, the lead seals *s*, *s* being fitted at the ends of the legs. After the lamp has been carefully exhausted the metal is melted and allowed to run in. During this process it is freed not only from oxide but also very largely from dissolved gases. If desired, the metal may be further boiled while the lamp is still at the pump. The lamp is started by heating with a Bunsen burner from the top until the metal is well molten. When started from the cold it usually lights up even before tilting. It is usually run on a lighting circuit of 100 or 200 volts with a back resistance adjusted to take a current of 5 to 7 amperes on short-circuit.

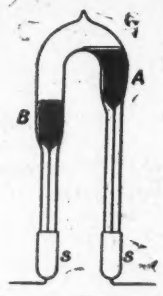


Fig. 1.—Cadmium-Vapour Arc Lamp.

The voltage on the terminals of the lamp is low, usually about 30. Owing to the fact that the small upper chamber holds the cathode, metal distils into it from the hotter lower anode chamber, and drips back again once every two or three minutes, causing a slight flicker, which does not, however, interfere with the use of the lamp. It is advisable after use to remove the metal from the bend of the tube, as it would probably otherwise set up strains on solidification which might lead to fracture of the glass. The lamp may be kept burning for an indefinite time, and yields a powerful light for optical purposes.

* Electrical Review, February 27th, 1914, p. 355, and May 22nd, 1914, p. 857.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Trade Discounts.

With reference to the meeting of the Motor Traders' Association, held at Leeds, the report of which was given in your issue of February 4th, I was certainly under the impression that if an electrical engineer was asked to fit a dynamo to a motor car he was entitled to trade discount from the manufacturers of the dynamo, as if this cannot be called work appertaining to an electrical engineer I shall be glad to know what can be; and an electrical engineer might with equal justification be refused trade discount on lamps used for motor-car headlights, or accumulators used for ignition or lighting purposes.

It might not be out of place to give my own experience regarding this. Some little time ago, having two orders from customers to fit dynamos to their cars, I inquired from one of the leading manufacturers of these articles regarding the cost, but was informed they could only be sold on the same terms to me as to the rest of the general public. I did not bother any further with this particular firm, but purchased them from another firm which was certainly more business-like, and at the time I made no remark whatever, owing to pressure of work.

I note, however, that the meeting eventually decided that electrical engineers are entitled to trade terms for articles like this, and I should hardly imagine it would require a Solomon to come to a decision of this sort. The motor traders seem to be a very highly favoured set of individuals, as they are enabled to purchase anything in the electrical trade at trade terms, and, apparently, there is no discussion about it. Further than this, it appears from the correspondence I frequently get that almost everybody is entitled to obtain electrical goods at trade terms. For instance, from my experience over a period of about two months, the following persons have stated that they can get trade discount on everything electrical that is made, through their works:—A leather merchant, wholesale clothier, draper, and grocer, and I should imagine, if one were able to go into it, almost every trade under the sun. Surely it is time, if the motor traders can make their trade such a close corporation that they even have to hold discussion as to whether electrical engineers should purchase a dynamo at trade terms, it is about time the electrical engineers retaliated by forming themselves into a similar combine to protect their interests; such a combination is, apparently, not unusual, as it is well known

that plumbers have had an association of this kind for a long while.

One of the chief things in the electrical trade is the extraordinary number of so-called factors, and I cannot possible see what use these are at all, as the wholesale firms seem to have sufficient representatives to sell their goods without anyone else intervening at all. Personally speaking, I do not know that I deal with factors, but I do know that factors make a point of calling at mills, and even at country houses where the electric light installation is looked after by a gardener; under these conditions the factors claim them to be considered as keeping their own engineer, and consequently they allow them the trade discount off everything, and the electrical contractors have to look on and say nothing.

The Electrical Contractors' Association is an association formed for quite a different purpose altogether, being mainly concerned about the question of the rights of corporations trenching on their legitimate business. Various ideas have been brought forward to enlarge the scope of the Contractors' Association, and try and make this more popular with the whole of the electrical contractors of the country, but nothing ever seems to have been done in any way to make this such a powerful organisation that the manufacturers and factors dare not keep on trading as they now do.

It certainly does not seem quite right that almost every other business in the country should be confined to its own particular trade customers, and yet the electrical business seems to be the one where any person who likes to go and ask for trade terms gets them. In some cases I have found that large engineering firms might be legitimately entitled to purchase at trade terms, seeing they keep their own men to carry out additions to their installation work; yet it does not seem to stop at this, and I have a case in mind now where, in addition to their purchasing at trade terms for the private houses of their partners, they even go further than this and purchase at trade terms for their churches and chapels. I also understand that the same thing applies to their managers and everybody else in their office on the same lines. I do not think that this can be in any way considered trading fairly, as if wholesale people consider they can deal with the electrical situation by means of factors, then there is no need at all for the electrical contractor, and he might just as well be out of business altogether.

Consulting engineers do not in any way assist the movement for fair trading regarding electrical contractors, as it has got to be common custom in the case of country-house installations for a consulting engineer to send out the wiring specification to the electrical contractor, and the engine specification to engine builders, and so on, whereas if the electrical contractors had some combination they would say they must have all or nothing, which is the answer that every consulting engineer gets from my place.

There is room for the Electrical Contractors' Association to extend the scope of their operations, as I am satisfied that they could make themselves into a very powerful factor to regulate the manner in which trade discounts are allowed, whereas at the present time complaints come before the E.C.A. at their different sections, and the usual end of it is that the firm in question is reprimanded, but whether the contractor gets any satisfaction out of it I do not know. I certainly think that the work that has been done by the secretary and executive of the E.C.A. reflects the greatest credit on them, but I have never yet heard any proposals made to force a limitation of trade discounts, simply because, as a fighting force, the E.C.A. does not exist, except on the lines of fighting for the question of trade with regard to corporations.

Contractor.

February 21st, 1916.

[We quite agree with the views expressed by our correspondent with regard to trade discounts. The subject has often been discussed in our columns. It is curious, however, to note that "Contractor" is unaware of the fact that the Electrical Contractors' Association originated from correspondence on this subject in the Electrical Review, and that it was formed mainly for the purpose of putting an end to the misapplication of trade discounts, direct dealing between manufacturers and the public, and similar grievances. The question of municipal trading became acute much later.—Eds. Elec. Rev.]

Cause of Flicker.

I have read Mr. Balsara's letter concerning the trouble he is experiencing through the cause of flicker on his D.C. generating sets, and the following might be of interest to him. A few years ago the same trouble occurred in this station on a 315-kw. D.C. reciprocating set, and it was some time before the trouble was located. A heavier flywheel was first tried, but this did not get over the difficulty, and the trouble was finally found to be due to the interpole field. Probably the field strength under the interpole was not always in proportion to the armature current at any load, due to the iron core of the interpole being saturated.

A shunt was fixed across the main leads carrying the whole current, and this entirely did away with any sign of flicker.

W. A. Walker,
Electrical Engineer to the Kettering U.D.C.

February 26th, 1916.

A SUCTION GAS PRODUCER USING BITUMINOUS COAL.

At a meeting of the Institution of Engineers and Shipbuilders in Scotland on January 25th, Mr. R. V. Farnham read a paper on this subject, the data for which had been obtained from producers of 100, 250, and 500 B.H.P. All of these were supplying gas to electric power generating plant.

Fig. 1 shows the 100-B.H.P. size in section. A is the space into which the coal is fed through the door at that level. B is the chamber which contains the initial charge of gas coke. F F are the steel rams coupled to the rising grate; these rams have machine-cut teeth gearing into pinions. C is the main steam raiser. E is the sliding plate for supporting the fuel bed whilst charging the producer with coal. A 3-B.H.P. electric motor is coupled to the gearing which operates the sliding plate and the rising and falling grate. Suitable reducing gear is connected to the clutch gearing, which, in turn, carries out the four operations, viz., (1) the raising and lowering of the grate; (2) the inward and outward travel of the sliding plate.

This 100-B.H.P. producer, tested by Dr. Dugald Clerk, developed 4,824 B.H.P.-hours, in 48 hours. The grate area is 706.8 sq. in., equal to 6.6 sq. in. per B.H.P. A small cooler was fitted between the engine and the producer to cool the gas to atmospheric temperature, and was the only chamber employed in rendering the gas fit for use in the engine. Bituminous coal was used containing 34 per cent. of gas and tarry matter, and after the run no trace of tarry matter was found on the valves of the engine.

The essential features of the producer are the rising and falling grate and the sliding plate, and the chief characteristic

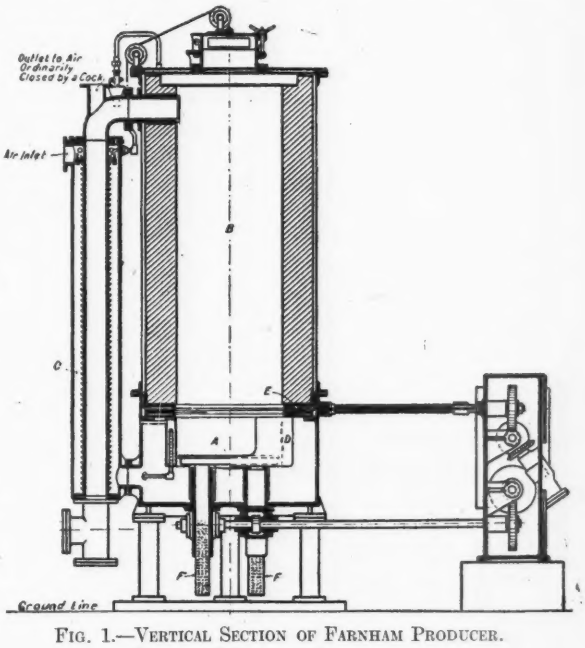


Fig. 1.—Vertical Section of Farnham Producer.

is the feeding of the coal through the firing door at the bottom of the producer.

The method of working the producer is as follows:—Ordinary gas coke is fed on to the grate when at its lowest position through the hinged door at the top of the producer. This charge of coke is brought up to the level of the gas outlet. The engine is allowed to run from one to two hours, according to the load, with gas which is generated from this coke only. As soon as it is necessary to begin to charge the producer with bituminous coal, the grate is raised to the level of the sliding plate, the travel of which is about 10 in. The sliding plate is now driven across the fire between the bottom of the fuel bed and the top surface of the grate. The grate is lowered to its lowest position, and the bituminous coal is then thrown through the firing-door opening on to the grate. As soon as this space is packed tightly with the coal, the sliding plate is withdrawn, allowing the incandescent fuel gradually to settle on to the fresh fuel. The firing door is now closed, and the same procedure is followed at intervals, which are determined by the load that the producer is carrying.

The pressure of the rising grate causes the fuel, which it supports, to become very dense and compact, preventing channels or cavities from forming in the fuel column, without the necessity of any poking of the fuel. This characteristic of applying pressure to the glowing mass of incandescent carbon is very important; in fact, it is the main principle of

the suction producer in question. The pores of the fuel bed being closed by this pressure, the oxygen of the air which enters the firing door, whilst charging, comes into contact with a body of fuel which is of very close formation, and the necessary reactions take place, with the result that the gas generated is the same approximately as was generated immediately before charging.

If air and steam are being drawn through the outside steam raiser C (fig. 1) to the underside of the grate immediately before charging, and the percentage of hydrogen (H_2) is from 12 to 20 per cent., and the calorific value is from 130 to 140 B.TH.U. per cubic foot of gas generated, then a similar quantity of hydrogen (H_2) must be present in the gas which is being generated while the firing door is wide open. This hydrogen content is obtained whilst the operation of charging is going on, by simply damping the coal with water before it is introduced into the producer.

After the firing door is closed and the sliding plate withdrawn, it is most important to bring the fresh charge of fuel to a temperature that will prevent the regular supply of steam from condensing, and as quickly as possible, because the first object the steam comes into contact with, on entering the space under the grate, is cold and wet coal. This would, naturally, condense the steam flow, and the result would be that the gas would be minus its hydrogen content.

The raising of the fresh charge of coal to a temperature that will prevent condensation is carried out by pre-heating the air by means of an iron casing bolted to the top cover of the producer. The air entering the casing on one side of the cover is distributed over the entire surface of the producer top cover, and discharges through a pipe bolted to the outside steam raiser. This arrangement is clearly seen in figs. 2 and 3. The temperature of the air is as high as 350 deg. F. when it first comes into contact with the water flowing round the rings of the steam raiser itself, and, consequently, it enters the space under the grate slightly cooler than this.

Indicator diagrams demonstrate the regularity of the gas value whilst the operation of charging the producer is carried out.

While minor mechanical and gasification difficulties were met with and overcome in the 100-B.H.P. size, it was not until the larger sizes were made that very real difficulties began to assert themselves. The smallest size, that of 100-B.H.P. capacity, had a grate area of only 4.9 sq. ft., or 2 ft. 6 in. diameter, and no trouble was met with in employing an ordinary steel sliding plate ⅜ in. thick.

When the diameter of the grate was increased to 3 ft. 9½ in. (250 B.H.P.) and 5 ft. 10¼ in. (500 B.H.P.) the plain steel plate was found to be unworkable. In the 250-B.H.P. producer a single water-cooled plate is used, and is clearly shown in figs. 2 and 3; in the 500-B.H.P. size two water-cooled plates are employed, both plates working towards the centre of the fire.

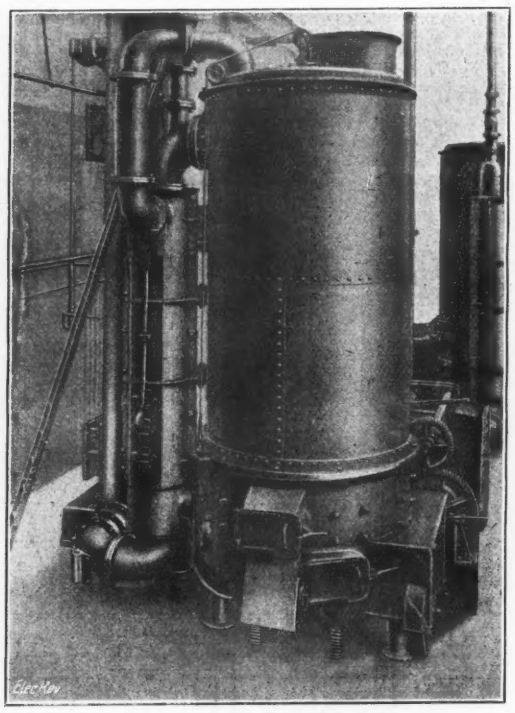
Though these water-cooled plates were subjected to a pressure test of 50 lb. per sq. in. before using them, after a few weeks' work the plates began to fail; the front end had a bevelled edge of about 3 in. width, and this bevelled edge would always split, due to the circulating water not reaching the extreme end of the plate. This trouble has been entirely obviated by the use of electrically-welded joints, which bring the circulating water to within ⅜ in. of the extreme end of the plate.

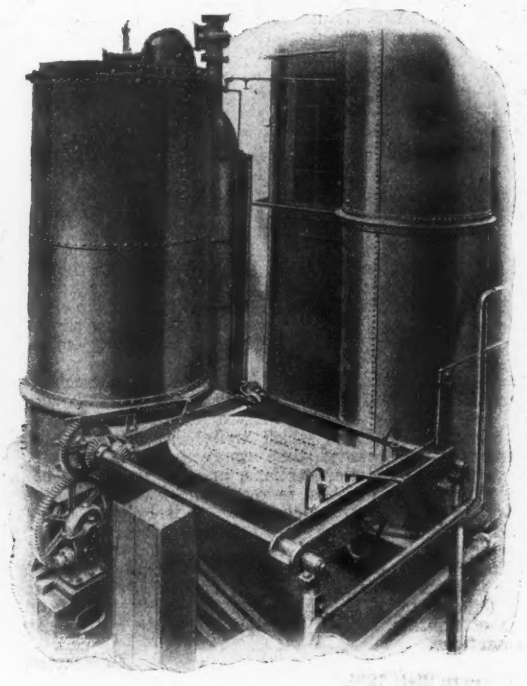
In the largest size (500 B.H.P.) a resistance is fitted in the main drum controller which regulates the speed of the motor in such a way that the plates are *withdrawn* at a reduced speed, allowing the inward travel of the plate and the raising and lowering of the grate to remain the same as in the other sizes.

In fig. 1 it will be seen that the main steam supply is obtained from the ribbed gas-main, which is surrounded by a cast-iron casing, through which the air, after leaving the pre-heater, is drawn on its way to the grate. This steam can only be generated when the gases, leaving the top of the producer, are hot enough. As the producer is started on the initial charge of coke, the gases generated before the first charge of bituminous coal is introduced would not reach the necessary temperature to raise enough steam to bring the calorific value of the gas up to the normal, and at the same time keep down the temperature of the fire.

A supplementary steam raiser has been designed in the form of a very fine jet of water distributed over the surface of the underside of the grate and the surrounding cast-iron grate guide, as well as the cast-iron bottom of the producer itself. When the gas has reached a temperature sufficiently high that steam can be raised by the gas main, the jet is dispensed with.

The regulation of the admission of steam to the fire is of the utmost importance when anthracite or coke is being gasified, but it is not so important when gasifying bituminous coal in the suction-type producer. The percentage of hydrogen is lower than usually met with in gas from producers using anthracite coal.





Figs. 2 and 3.—Farnham Gas Producer for Bituminous Coal.

From 25 samples the average hydrogen content was only 10.29 per cent., but the average calorific value of the same 25 samples was 143.16 B.TH.U. per cubic foot (higher value).

Various classes of bituminous coal are being gasified most successfully by the producer under review; the upward pressure of the rising grate causing the fuel to become thoroughly homogeneous renders caking coal just as suitable as the non-caking variety. Small coal has been found more suitable than large coal. Coal containing a high percentage of ash curtails the period that the producer can work without a complete clean out.

The most important feature of the Farnham producer is the entire absence of cleaning plant of any description, the only auxiliary chamber to the producer itself being the cooler.

Though the temperature of the gas before entering the cooler is high, it is absolutely free from any tarry matter, and when the gas leaves the cooler it is at atmospheric temperature and ready for use in the engine.

Gas enters the cooler at the base, and after leaving the coke in the lower half of the chamber, comes into contact with a very fine gauze screen, which can be rotated from the outside by means of a chain and pulley. This screen prevents any soot leaving the chamber, as jets of water play on the upper surface of the gauze, and drive the soot down-

wards into the coke immediately below. The coke itself has a separately controlled water supply.

The screen is always placed vertically until the first charge of bituminous coal is fed into the producer; by the time this is done, the coke has become hot enough to distil off any tarry matter which may have been present in the first charge of coke.

A screen working to-day has not been removed from the cooler for over one year, and the mesh of the screen is as clear as when first fitted. This mesh has 80 divisions to the square inch.

The ash content of the coal used determines the length of time the producer can generate suitable gas. With an ash content of 5.3 per cent., 148 hours' running has been obtained on a 250-B.H.P. producer without a pound of clinker being withdrawn. Of bituminous coal 12.8 tons were gasified, 22,000 B.H.P.-hours were obtained, and after the producer was cooled down about 1,200 lb. of clinker were withdrawn through the firing door.

A battery of these producers of 250 B.H.P. is now producing gas on the suction system from bituminous coal for driving gas engines of 850 B.H P. This producer is always run out entirely after the completed period of running; no charge of bituminous coal is ever introduced during the last 10 or 12 hours' run.

Careful consumption tests with bituminous coal gasified in the Farnham producer show a net fuel consumption of 1.47 lb. per B.H.P.-hour, including all losses, week in and week out. On the 500-B.H.P. size 2.01 lb. per KW.-hour was the consumption of fuel recorded weekly, the cost ranging from 13s. to 20s. per ton, against anthracite costing from 30s. to 40s. a ton.

WAR ITEMS.

Russian Journalists and German Commercial Penetration.—At the dinner given by the Newspaper Proprietors' Association on, February 23rd, to the Russian journalists now on a visit to this country, M. Egoroff, in replying to a toast, referred to the supreme importance of commercial relations between the Allies and Russia, and to the "penetration" policy practised by Germany. We quote the following extract from his most interesting speech from the "Times" report:—"Gentlemen, it has become an established axiom in political as well as in literary spheres that the most reliable guarantee of stable friendship between separate countries must be sought in their respective business relations. That is an idea which I, however, must accept with considerable reservations. It seems to me that the war has already introduced a very important factor. It has shown that economic relations may give place before other considerations of a more exalted order, moral and political. Let us not forget that Germany did not hesitate to declare war upon Russia, although her trade with that country ranked as one of the most important assets in German commercial prosperity. On the other hand, we have no example in history when the Russian nation entered upon a war with greater enthusiasm than now. Yet our trade with Germany was also one of the most important factors of our material welfare. What is the explanation of this apparent contradiction in terms? The answer is a simple one. There is one kind of trade which involves mutual benefit, another kind which is tantamount to a pacific conquest. Germany stood on the latter footing. In her commercial penetration into other lands she sought not only a means of self-enrichment, but a sure road to gradual conquest. She was aiming at the subjugation of the Russian people by means of her commercial and financial influences. Therein lies much food for reflection. Let us hope that our Allies, who are stronger than ourselves in the domain of industry, will not leave the German road an open one, but that they will oust Germany from the Russian market and succeed in establishing a basis of just and equitable business relations with Russia. There is no other method for assuring in the future the stable development of mutual friendship which will place our countries beyond the menace of any unforeseen events."

Wood Pulp and Tramway Tickets.—The February issue of the "Journal" of the Tramways and Light Railways Association contains a copy of a communication sent to the Board of Trade on February 16th by that Association respecting the possible effects of the restriction of importation of wood pulp on the production of tramway and omnibus tickets. The Association acted on behalf of itself, the London Omnibus Owners' Federation, the British Electrical Federation, Ltd., and the Provincial Omnibus Owners' Association (Incorporated).

Aircraft Risks.—The leading departments of Glasgow T.C. have considered the advisability of insuring their respective works against aircraft risks. The Tramways Committee decided, by 14 votes to 13, against insuring, while the Electricity Committee, by 17 votes to 9, proposed to insure the generating stations at Port Dundas and St. Andrew's Cross.

Reserved Occupations and Exemptions.—The revised list of reserved occupations issued by the Board of Trade on February 2nd contained the following:—

Electrical generating stations (including those for tramways and electric railways): All classes of workmen.

Gas works: All classes of workmen inside the works.

Tramways: Traffic inspector; driver, chief storekeeper; parcel superintendent.

Mechanics, etc., in all industries: Mechanics and other similar men engaged in the maintenance and repair of plant, machinery, and tools.

The Saltburn Military Tribunal last Friday exempted for two months Mr. T. W. Hulton, assistant electrical engineer to the Cleveland Trust. It was pleaded that he was the only person left to look after underground mains, that the original staff had been reduced from five to two men, including Mr. Hulton, and that advertisements had failed to find a successor with suitable qualifications.

The Halifax Tramways and Electricity Committee has recommended that the Ministry of Munitions be asked to take over, as controlled establishments, the tramways and electricity departments of the Corporation.

The Bolton Tramways Committee has decided to make application to the Ministry of Munitions for a certificate that the supply of tramway facilities by the Corporation is of importance to carry out munition work efficiently.

At a meeting of the Military Service Act tribunal at Dorking, on February 22nd, the chief accountant of the Electricity Co. applied for exemption, and was granted two months' extension only.

At the Recruiting Tribunal at Wallsend-on-Tyne, application was made, on February 25th, for the total or temporary exemption of a tramway conductor on the Tyneside Tramways and Tramroads Co.'s system. It was stated that the company was short-handed, and that that morning they had been unable to run a workmen's car. They would either have to stop the cars or employ female conductors, but before they could employ female conductors it was necessary to make certain alterations. A postponement for one month was granted.

Application is to be made to the Ministry of Munitions by the Glasgow Tramways and Electricity Committees for a certificate making the departments controlled establishments, and permitting the municipality to that extent to come under Section 7 of the Acts which prohibits the employment elsewhere of persons who have left munitions factories.

Dearth of Machinery in Russia.—With reference to our leading article of last week, the Board of Trade "Journal" quotes a report from the British Vice-Consul at Ekaterinburg, to the effect that in Ural mining works a great dearth of machinery in general is now beginning to be very seriously felt, and fears exist as to whether allied and neutral powers will be able to replace the tremendous quantity of machinery that Germany formerly supplied to Russia. Not to mention new enterprises, the machinery which is at present in use, owing to the difficulty of obtaining spare parts, is likely to be run out, so that practically all current businesses will require new machinery after the war. The demand for catalogues and specifications in the Russian language has never been so acute as it is at the present time. Russian buyers are at a loss to find out whence to obtain prompt and reliable information as to where special requirements may be bought. Great preparations should be made by all firms anxious to share in business in the Russian market after the war. Travellers having a good knowledge of the Russian language, as well as a technical knowledge of machinery, should be sent out to the Ural mining works, where the Russians would be only too glad to give them every assistance.

An Italian Company's Difficulties.—Owing possibly to the influence on traffic exercised by the war, the Società Tramvie Vicentine is in financial straits, and a petition for its liquidation has been filed by the Banca Popolare, of Vicenza. The Society, however, last August applied for and secured the protection of the moratorium, after a court expert had reported favourably on its finances. A meeting of shareholders is to be called to decide on its future course of action. The Society was started in 1906, and works some 135 kilometres of line between Vicenza, Valdagno, Chiampo, Recoaro, Bassano and Montagnana, and receives governmental, provincial and communal kilometre subsidies, which guarantee its bond indebtedness. Its capital is 4,000,000 lire in 100 lire shares.

After-the-War Trade.—The Council of the Birmingham Chamber of Commerce, in its annual report, expresses the hope that the Government will not fail to take such steps as may be necessary to enable the manufacturers and workers of the country to consolidate their position and enter into international competition after peace is declared without those enormous disadvantages which prevailed before the war.

It is stated that, on Tuesday next, Mr. Asquith will receive the deputation appointed at the Guildhall meeting on trade and employment after the war.

Enemy Trade Marks in Australia.—In furtherance of its policy of stamping out German influence and German trade, the Australian Commonwealth Government has suspended the trade marks of 450 articles of enemy manufacture.

Trading with the Enemy.—The "London Gazette" for February 29th contains lengthy lists of persons or bodies of enemy nationality or associations in Greece, Morocco, Netherlands, Norway, Portugal, Portuguese East Africa, Spain, and Sweden, with whom or which trading is prohibited. A number of electrical companies are included.

The Board of Trade has made Orders requiring the undermentioned businesses to be wound up:—

Calmon Asbestos and Rubber Works, Ltd., Sheppy Place, Minories, London, E. Controller: Mr. E. H. Fletcher, 14, George Street, Mansion House, E.C.

Rhenish Rubber and Celluloid Co. (1908), Ltd., Basinghall Street, E.C. Controller: Mr. J. S. Cotman, 10, Coleman Street, E.C.

Harburg and Vienna India Rubber Co., Ltd., Golden Lane, E.C. Controller: Mr. C. W. M. Kemp, 36, Wallbrook, E.C.

Manchester and Future Municipal Contracts. — The "Morning Post" states that the Manchester City Council was on Wednesday to be asked to confirm a resolution to the effect that all municipal corporations in England and Wales should have their attention called to the following standing orders which have been adopted by the City Council:—"No contract shall be entered into with any person of German or Austrian nationality; no contract shall be entered into with any firm or company whose subscribed capital, whether by way of shares or otherwise, is held or controlled to the extent of one-third or upwards by persons of German or Austrian nationality." The resolution adds that the Town Clerk be instructed to transmit a copy to the Town Clerk of each borough with a suggestion that the respective councils will take into consideration the advisability of adopting similar standing orders.

LEGAL.

Attwell *v.* West Ham Corporation.

The West Ham Corporation on February 24th unsuccessfully appealed to Justices Ridley and Avory in a King's Bench Divisional Court against a judgment at Bow County Court, where a jury awarded Mr. A. E. Attwell, an electrical engineer, £350 damages against the Corporation for personal injuries he received through the negligence of the Corporation's servants. The matter has already been reported here. The plaintiff's case was that he was working at a H.T. chamber when an explosion occurred, with the result that he was severely injured. The West Ham Corporation appealed on the ground that there was evidence of contributory negligence, but Counsel for the respondent took the preliminary objection that the appeal was out of time, and that all the grounds of appeal were inadmissible by Sec. 120 of the County Court Act. The Court upheld the preliminary objection and dismissed the appeal with costs.

Munitions Cases.

At Oldham last week, the local Munitions Tribunal fined John Cox 7s. 6d. for a breach of the Act. His employers, a firm of electrical manufacturers, complained that he had attended at the works in an unfit state to work, being the worse for drink, and after being warned he repeated the offence; he later asked for his leaving certificate, which was refused, and he was told to come to the works when he was sober, but he did not return.—The Tribunal declined to grant leaving certificates to three Belgians who were employed by the same firm, and wanted to go to a place in London where they could earn more money.

A South Wales Mines Case.

On February 25th, at Merthyr, Mr. H. Thomas, manager of Hill's Plymouth Co.'s Graig Collieries, and Mr. W. W. Green, agent to the collieries, were summoned for nine offences in respect of electrical plant. The matter is reported in the *South Wales Daily News*, from which paper we quote. Mr. Vachell of the Home Office, who prosecuted, explained that at the collieries in question—the Nos. 1 and 2 South Pits—there was a very extensive electrical plant with over 20 miles of cable and 26 motors. The plant was one of the oldest, and was getting very antiquated. In August last there was a non-fatal accident at the collieries and one of H.M. inspectors was sent to make an examination. As a result of that Mr. W. J. Charlton, the inspector, would tell the Court that the plant was "extremely neglected," and was in "a very dangerous condition." The summonses had been taken out "to illustrate various offences," but they could have taken out a hundred.

Mr. C. Kenshole, for the defendants, raised objection to such a remark.

Mr. W. J. Charlton, junior Inspector of Mines, said that when he called Mr. Thomas's attention to the condition of the cable he said he had no idea it was in such a bad state, and he quite agreed that it was unfit for use.

Mr. C. Kenshole: Do you know the company are gradually putting in and installing new cables throughout these collieries?—I understand they are trying to comply with the rules.

They are gradually putting in armoured cables and replacing old cables?—I did see some old cables replaced.

Do you agree that to get cable now is a most difficult matter?—It would be some time before the whole could be completed.

Mr. W. W. Green said he had been for 12 years agent to the Hill's Plymouth Collieries, whose annual output was about 600,000 tons. He was not aware of any breach of the regulations in regard to the electrical apparatus in the mine. There was now a great difficulty in obtaining cables. The cables were from time to time damaged by falls of roof—and there were exceptionally bad roofs in these collieries, probably the worst in South Wales. The overlying strata were very weak and saturated with water. Probably these mines were the wettest in Wales, and possibly in the kingdom.

Mr. Henry Thomas, manager, said the company were gradually introducing new plant. The electrician had reported from time to time up to October 7th that the insulation was good. It was impracticable for witness to follow the electrician step by step to see that he was doing his duty.

The cases were adjourned until a date to be mutually agreed upon.

B.E.T.—Reduction of Capital.

The Court of Appeal, composed of the Master of the Rolls and Lords Justices Phillimore and Warrington, on Monday, heard an appeal by the Public Trustee as the executor of the late Leopold Salamons, the holder of £12,960 income certificates of the British Electric Traction Co., Ltd., from an order of Mr. Justice Astbury, sanctioning upon the petition of the company a reduction of its capital from £4,000,000 to £2,998,397 15s., and also sanctioning the scheme of arrangement under Sec. 120 of the Companies' Consolidation Act, 1908, so as to bind the various classes of shareholders and also the holders of income certificates issued by the company.

Mr. Clauson, K.C., in support of the appeal, contended that the scheme of arrangement under which the reduction of capital was effected might involve his client in some future liability.

The hearing was adjourned for a fortnight to enable the company to file further evidence.

Farrell *v.* Bloxam.

Mr. Justice Pim, in the High Court, Dublin, granted an application for service of a subpœna out of the jurisdiction on Mr. A. N. Moore, formerly chief assistant electrical engineer at the Belfast electricity works, now borough electrical engineer at Newport, England, who is a necessary witness in the action for slander brought by Mr. A. B. Farrell, resident superintendent in the Belfast central station, against Mr. T. W. Bloxam, chief electrical engineer, Belfast.

Assessment of Colliery Power Stations.

The Divisional Court, on February 25th, granted an application by Mr. Ryde, K.C., on behalf of the Pontypridd Union against the Cambrian and other colliery companies in Glamorgan, asking for an extension of time for setting down appeals. It was stated that the cases referred to the assessment of electrical power stations at the collieries.

CONCERNING DISCOUNTS.

By A STATION ENGINEER.

During recent years manufacturers have acquired the habit of sending out price lists with the most astonishing array of discounts attached. A glance through recent invoices gives the following discounts:—20, 10, 5, and 5 per cent.; 33⅓ and 30 per cent.; 7½, 15 and 10 per cent., plus 5 per cent. advance; 20, 7 and 10 per cent.; plus 10 per cent., less 33⅓. Just why makers do this kind of thing it is not easy to understand. Perhaps one reason is that buyers often add the discounts together, thinking to get an approximate result that way. Thus 20, 10, 5, and 5 per cent. sounds like about 40 per cent.; at any rate, a smart salesman will say that, and doubtless many an order has been booked on this understanding. A little thought will show that adding the figures together does not give the correct answer at all. Take this case:—20 per cent. off 100 gives 80. Then the 10 per cent. deducts 8, leaving 72. The two 5 per cents. reduce that to just under 65, so that the total effect of the discounts is only equivalent to 35 per cent., and not to 40 per cent. Similarly 33⅓ and 30 per cent. works out at 53⅓, and not at 63⅓ per cent. The strange assemblage of 7½, 15, and 10 per cent. looks like 32½ per cent., but it works out at 29·2 per cent.

The question frequently arises, does the order in which the discounts are taken make any difference? The answer is that the order makes no difference at all. The writer has had many arguments with friends on this point, and calculations have even been produced giving the opposite result. Yet the truth of the proposition can easily be shown. Taking 20 per cent. and 10 per cent. discount off an amount is equivalent to multiplying it by ·8 and ·9, while taking 10 per cent. and 20 per cent. off is the same as multiplying it by ·9 and ·8. Obviously, the effect is the same in either case. Similarly it makes no difference whether a percentage advance in price is added before or after the discount is taken.

May one suggest that there is something silly in these elaborate discounts. Manufacturers would save so much time and labour if they quoted the equivalent figure instead of a multitude of discounts and advances, that it is hardly credible that they keep up the present method. The following accounts, copies of actual invoices, will show the waste of labour in making out accounts on the repeated discount system :—

		£4	9	6		£0	2	8
(1) Less 20 %	...	0	17	11	(2) Less 20 % ...	0	0	6
		3	11	7		0	2	2
„ 10 %	...	0	7	2	„ 7½ % ...	0	0	2
		3	4	5		0	2	0
„ 7½ %	...	0	4	9	„ 10 % ...	0	0	2
		£2	19	8		£0	1	10
		£2	10	7		£2	18	0
(3) Less 7½ %	...	0	3	9	(4) Less 25 % ...	0	14	6
		2	6	10		2	3	6
„ 15 %	...	0	7	0	„ 15 % ...	0	6	6
		1	19	10		1	17	0
„ 10 %	...	0	4	0	„ 10 % ...	0	3	8
		1	15	10		1	13	4
Plus 5 %	...	0	1	9	Plus 5 % ...	0	1	8
		£1	17	7		£1	15	0

The ideal method would be to quote the multiplier which would give the amount right off without subtraction. If we further adopt Mr. Planchon's decimalised shilling as the coinage unit, the above accounts would read thus :—

(1) 89·50s. at 66·6 % 59·60s. (2) 2·67s. at 66·6 % 1·78s.
(3) 50·59s. at 74·3 % 41·53s. (4) 58·00s. at 60·2 % 34·91s.

It is worthy of note that the equivalent discount does not give the same result as the repeated discounts, as errors necessarily accumulate in the latter method.

May we hope that a system capable of such perfect simplicity will ever come into use ? Or are we to be put off by the conservative tendencies which form so strong a characteristic in our nation, tendencies which cause us to say that that kind of thing is all right for the benighted foreigner, but we are different ? As one friend puts it, "If we had the decimal system of weights and measures and coinage, and simplified spelling, there would be nothing left for the schoolmaster to teach, and that would never do."

BUSINESS NOTES.

Board of Trade Inquiries.—The British Consul at Bordeaux reports that a local agent wishes to obtain agencies for British makers of electric lamps, for which there is a very great demand, the market having previously been inundated with German products. He says that manufacturers who wish to profit by this opportunity must be prepared to adopt the German system of sending stocks to agents, the latter sending monthly statements of sales. Applications regarding the matter should be addressed to the Board of Trade Commercial Intelligence Branch in London.

The Branch has received applications from firms at home for names of makers of :—Electric switches, ironclad, and switch parts ; tinned iron and steel wire ; coppered steel wire.

Patent Restoration.—Mr. W. Reavell and Messrs. Reavell & Co., Ltd., have applied for restoration of Patent No. 17,026 of 1907, granted to them for "Improvement in mechanism for converting rotary into reciprocating motion, applicable to pumps, compressors, and other machinery."

Condensing Plant Contracts.—The Mirrlees Watson Co. have recently received orders for condensing plant from a number of colliery companies, iron and steel companies, co-operative societies and others. Also a number of separate condensers and air pumps for various munition works, and for France and Russia.

Book Notices.—*How to Make a Transformer for Low Pressures.* By Prof. F. E. Austin, 11, South Park, Hanover, N.H., U.S.A. Price 40 cents in America.—This brochure should be very useful to amateurs wishing to build a small transformer for operation on lighting supply circuits, without using any costly tools, yet with the certainty of obtaining reasonably high efficiency and a reliable piece of apparatus. The data and specification clauses included should be useful also in building small transformers for laboratory use. The author gives complete instructions for making a ring-type, step-down transformer with tappings giving various pressures down to 8 volts, when supplied at 110 volts in the primary circuit. The transformer yields 100 watts output at 90 per cent. efficiency, and may be worked temporarily at 400 watts, the efficiency being then about 70 per cent. Figs. 2 and 3 in the booklet are capable of a good deal of improvement, but the author's meaning seems never in doubt, and any reader should be able to construct quite a satisfactory transformer from the instructions given. Among the uses to which such a transformer may be put are ringing door bells, operating small arc lamps or low-pressure tungsten lamps, performing light welding work, charging accumulators (using an electrolytic rectifier), operating small series motors, operating spark coils, and so on.

The Faraday House Journal for the Lent Term contains a portrait of Mr. C. P. Sparks, President I.E.E. and senior past-President of the Faraday House Old Students' Association, articles on the origin of the Fahrenheit scale, by Mr. G. Scott Ram, and on the Lake Coleridge (N.Z.) hydroelectric scheme, and numerous personal and other minor items, with portraits of past and present students serving with the Forces.

The Path Publishing Co. have in preparation a book by Mr. D. N. Dunlop, A.I.E.E., entitled "British Destiny—The Principles of Progress." The author will show the philosophical basis of voluntary co-operation and its possible combination with the British policy of Individualism, while preserving the full value of the latter. A scheme for national industrial federation will be outlined.

Bankruptcy Proceedings.—A. B. Craig, merchant, 8, Well Street, Cripplegate, E.C., trading as John Craig & Sons.—A sitting of the London Bankruptcy Court was held on Wednesday before Mr. Registrar Hope for the public examination of this debtor, who returns total liabilities £34,292, of which £23,668 is expected to rank, against net assets valued at £25,753, or sufficient to yield a margin of £2,085, after payment of all indebtedness. The debtor had been connected with a syndicate which had promoted several companies, including the Sturgeon Falls (Canada) Electric Light and Power Co., Ltd., whose operations were brought to a standstill by litigation. A dispute had been referred to arbitration, but the arbitrator died before making his award, and the matter was still before the Courts on appeal. Witness was entitled to 1,942 $10 shares in the Electric Co. ; it had paid no dividends, but had made profits, and witness valued his shares at £15 each, or about £30,000 in all. The Official Receiver suggested that the shares were not worth a brass farthing, as they related to a concern in a small town with works in the backwoods. The debtor asserted that, on the contrary, the shares were very valuable. The examination was formally adjourned till after the next meeting of creditors.

J. Whitehouse, Ltd., 15, The Parade, Golders Green, Middlesex. The following are creditors herein :—

Hands, A. C.	£171	Electrical Co.	£33
Armorduct Manufacturing Co.	101	Metallic Tube Co.	19
Sloan Electrical Co.	36	Sun Electrical Co.	286
Gurney, S., & Co.	85	Regent Wall Paper Co.	36
Russell & Co.	116	Colthurst & Harding	14
Siemens Bros.	18	Shearn, H. J., Ltd.	14

G. J. T. J. Parfitt, consulting electrical engineer, 11, Priory Road, Keynsham, Somersetshire.—An application was made at Bristol, on February 25th, for the discharge from bankruptcy of the above-named debtor. According to an amended statement of affairs prepared, the debtor's liabilities were estimated at £2,615, but would probably amount to £3,119. The assets were expected to produce *nil*, but realised £97 odd. A first and final dividend was paid on proofs for £2,266. The Official Receiver reported that the assets were not sufficient to pay 10s. in the £, and that the debtor had omitted to keep proper books of account. On behalf of the debtor it was stated that he had been the victim of misfortunes. The various enterprises upon which he had embarked were in connection with the business, which he had hoped to develop by means of them. He had incurred a heavy loss in connection with the Bristol International Exhibition, and the war coming after that, had simply shut down his business. His Honour said the debtor had failed to keep sufficient books to disclose his business transactions, but he would grant the discharge, subject to a suspension of two years.

Catalogues and Lists.—Messrs. Holophane, Ltd., 12, Carteret Street, Queen Anne's Gate, London, S.W.—New 84-page trade catalogue, containing illustrations of a wide range and variety of Holophane electric light fittings. Many excellent designs are given of brackets, office lighting standards, semi-indirect fittings, reflector bowl pendants, ceiling fittings, Excellite glassware pendants, sphere pendants, and electroliers with Holophane glassware. Sizes, prices, and finishes are indicated.

The British Thomson-Houston Co., Ltd., 77, Upper Thames Street, London, E.C.—New complete lamp price list (No. L 10,100) of 48 pages. This is, however, not merely a price list for it contains a great deal of data and tables respecting Mazda lamp characteristics, which should be useful to those interested in such matters. Forty-nine distinct types of Mazda lamp with tungsten filaments are now listed for various voltages, wattages, &c., for all classes of service. B.T.H. carbon lamps in the standard, radiator, and decorative types are also included. Half-tone photographic views show examples of interior lighting of shops, restaurants, business premises, theatres, &c.

Messrs. G. St. John Day (Patents), Ltd., Bank Mill, Morton Street, Oldham.—Illustrated pamphlet containing particulars and wiring instructions respecting the One-part lampholders and adaptors, the "Daybreak" switchholder, and the "Kombyn" insulation lampholder.

Liquidation.—Renew Electric Lamp Co., Ltd.—A meeting is called for March 29th, at 6, Old Jewry, E.C., to hear an account of the winding up from the liquidator, Mr. J. E. Percival.

Ediswan Showrooms in Australia.—The accompanying picture shows the interior of the Melbourne showroom of the Edison and Swan United Electric Light Co., Ltd. Notwithstanding all the difficulties of shipping in these days, the company is enabled to make there a very useful collection of articles of such classes as find a sale in our Australian Colonies. The company has made a special study of the requirements of this particular market. It will be remembered that one of the directors recently made a tour of the Colonies in the company's interests, and such visits are exceedingly helpful in enabling a company to follow a line likely to fit in with the desires of our kith and kin. The stocks at Melbourne are being added to continually as new lines come along. The photograph shows such familiar lines as luminous radiators, Bastian heaters, fans, and Holophane glassware. There is not the slightest doubt that the demand for British electrical manufactures in Australia is very large at present, and the company

Ediswan Showrooms at Melbourne.

has chosen the right moment for extending its activities in that market. The anti-German movement there is so strong, and writers and statesmen alike have been so thorough-going in their dealing with enemy companies, that the opportunity for our firms to do increasing trade is bound to be better than it has ever been before. Many of our electrical and allied firms already have branches in Australia, &c., and the Edison & Swan Co. has branches in Melbourne (368, Little Collins Street), Sydney (58, Clarence Street), Brisbane (32-4, Adelaide Street), and sub-agencies in Adelaide and Perth, as well as agents in seven towns in New Zealand (Wellington, Napier, Auckland, Gisborne, Christchurch, Invercargill and Dunedin), where Ediswan branded or agency goods may be obtained. The company also has its agents in Johannesburg, Malay and the Straits Settlements, and in India and Burmah.

Trade Announcements.—Mr. J. Martin Blair has removed to Central House, Kingsway, W.C.

The offices of the E. I. Hill Advertising Service have been removed to 26, Stanton Road, Wimbledon, S.W.

Messrs. Ernest G. Denner & Co., electrical engineers, of Sheffield, have removed from 150, West Street, to 284, Glossop Road.

Messrs. W. M. Wilson & Co., 19, Waterloo Street, Glasgow, have been appointed sole selling agents in Scotland for the Wells Electrical Co., London, who represent in the U.K. the Compagnie Française de Charbons pour L'Electricité.

Prices Advance.—The Benjamin Electric, Ltd., of Rosebery Avenue, E.C., have issued a notice respecting further advances in prices of a number of their manufactures.

For Sale.—Walsall Electricity Supply Department has for disposal two Bumstead & Chandler 250-h.p. steam engines, direct coupled to d.c. generators; one ditto 14 b.h.p. engine, coupled to forced draught fan; glass accumulator cells; four switchgear panels and three transformer panels. See our advertisement pages to-day.

LIGHTING AND POWER NOTES.

Aberdeen.—The engineer's monthly statement shows that during January 1,366,600 units were generated, an increase of 135,990 units, as compared with the corresponding month last year.

Argentina.—The Electric Light Co., of Mar del Plata, recently threatened to suspend the service owing to the municipality having dishonoured a promissory note in its favour for $50,000 m/n.

The inhabitants of San Jenaro (Province of Santa Fé) are contemplating the establishment of an electric lighting service in that town.—*Review of River Plate.*

Australia.—The Bundaberg (Queensland) Gas and Coke Co., Ltd., has been authorised to supply electricity for a period of 25 years within an area in the shire of Woongarra.—*Tenders.*

Aylesbury.—L.G.B. Inquiry.—The L.G.B. has informed the U.D.C. that an inquiry will be held into the application for sanction to a loan of £325 for electricity purposes.

Barton-on-Humber. — Street Lighting. — The Council has declined to pay the electric supply company's account for the past half-year's lighting amounting to £140, as owing to the lighting restrictions the lamps have not been lit for some time. The Council offers 50 per cent. in settlement, but this the company has refused, demanding 90 per cent. and threatening proceedings. The Council has decided to ask the L.G.B. for advice on the subject, and suggested that legislation should be introduced to deal with such matters. It is interesting to note that the Clerk to the Council is also secretary to the Electric Supply Co.—*Yorkshire Post.*

Bellingham.—Proposed E.L. Scheme.—The Council has approved of a proposed electric lighting scheme for the district.

Bingley.—The question of increasing the price of electricity for lighting has been deferred for 12 months.

The electrical engineer has been instructed to proceed with the wiring of the firemen's bells, in accordance with his estimate and the agreement with the Bradford Corporation as to the use of the tramway posts.

Birmingham.—Rate Aid.—The Electricity Supply Committee's contribution to the rate fund, for the year ending March 31st next, is to be £25,000, as against £35 000 last year, due to the increased price of materials and labour; the Tramways Committee will contribute £50,000, as against £30,000 last year.

Coal Shortage.—According to the *Morning Post*, the Corporation generating station practically ran out of coal on Monday, and as a result it was found necessary to suspend the tramway service for an hour or two, the cars being left standing in the streets pending the resumption of supply.

Blackpool.—The aggregate output of the electricity supply department during the past 10 months was 4,077,170 units, a decrease of 322,090 units, as compared with the same period last year. The effect of the lighting restrictions is shown by the great decrease during January in the amount of electricity supplied for public lighting. Last month the output under this head was only 2,000 units, compared with 15,868 units in January, 1915; 214 new consumers have been added during the last 10 months.

Bolton.—Owing to the numerous applications received for electricity for power, a Special Committee has been appointed to consider the whole question of capital expenditure with the Finance Committee.

Bradford.—The Electricity Committee has authorised an extension of mains from Apperley Bridge transformer chamber, across the bridge to the city boundary (including additions to the transformer chamber), at a cost of £400, and the sealing of an agreement for bulk supply to the Yorkshire Electric Power Co. through this extension. The Committee has approved a supplemental agreement with Messrs. Roby, Clifford & Co. and Mr. Wilfred Turner for the continuance of a bulk supply to Station Mill, Wyke. The Committee has also decided that the system at present in operation for obtaining cables from the British Insulated and Helsby Cables, Ltd., be continued for a further 12 months from April 1st next, and thereafter until further instructions are given in the matter.

Continental.—Italy.—The Government is making efforts to extend the use of water-power for the production of electrical energy in substitution for coal, for the supplies of which Italy is entirely dependent on importation; and a decree has been issued authorising the Minister of Finance to extend concessions for the diversion of watercourses without the formality of submitting the question to technical authorities for report, provided the rights of third parties are respected.—*B. of T. Journal.*

Experiments are being made on Italian railways with electrically-driven cranes for loading coal into engine-tenders. At Florence an Italian-built crane was employed in these trials, and at Naples a crane similar to those used on Prussian railways. The cranes are mounted on trucks and are each worked by two motors. The coal is brought in small trucks holding between 500 and 750 kg., and these latter are lifted bodily and their contents emptied into the tenders. The time taken in this operation is between four and eight minutes, three men being employed, the current required being 0·08 kw.-hour per ton.—*Industria e Invenciones.*

Dublin.—Cottage Lighting.—Reports of the Corporation Housing Committee contain estimates for the lighting of proposed working men's dwelling houses by electricity. In the North Lotts area the estimate for 201 houses (847 points) in the first section, is £1,143; second section, 245 houses (935 points), £1,259; and third section, 91 houses (387 points), £522. In the Newfoundland Street area the estimate for 125 houses (355 points) is £479; second section, 61 houses (305 points), £411; and third section (449 points), £673.

Epsom.—The U.D.C. on February 22nd decided to increase its charges for current as under:—Private houses and business premises, 7d. per unit; power, flat rate of 3½d. and on the sliding scale with a minimum of 1½d. for 3,000 units; public lighting, 4½d. per unit.

Heston and Isleworth.—Loan Application.—Application is to be made to the L.G.B. by the District Council for sanction to borrow £175 for mains extensions.

Huntingdon.—Refuse Destructor.—A L.G.B. inquiry was held, on February 22nd, into the application of the T.C. for sanction to a loan of £1,800 for the provision of a refuse destructor, which, it is estimated, will effect a saving of £100 a year. There was opposition only with regard to the proposed site, but the Inspector intimated that a loan would not be granted unless the Board was convinced that the destructor was an absolute necessity.

Ilford.—New Tariffs.—The Council proposes to adopt revised tariffs for electricity supply, which will be subject to the war increase of 12½ per cent. Included are a rateable value tariff of 12½ per cent. per annum, plus ¼d. a unit, flat and maximum demand rates, a sliding scale for power and special rates.

India.—Electrical Pumping.—The Bangalore Municipal Commissioners have decided to electrify the pumping plant at the waterworks, for which purpose electricity is to be taken from the Cauvery Falls power station.—*Indian Engineering.*

Ipswich.—Price Increase.—The T.C. has increased the price of current for lighting from 4½d. to 5d. per unit, and the tariff for heating, cooking, power, &c., by 15 per cent., making 25 per cent. advance since June, 1915, while rebates in connection with the charges for supply through prepayment meters have been abolished.

Kingston-on-Thames.—The T.C. has increased the price of current supplied to the Thatched House, Richmond Park from 7½d. to 8d. per unit.

Leeds.—Proposed Price Increase.—An increase of 10 per cent. in the charges for the supply of electricity, as from March 31st to the end of March 31st, 1917, is to be proposed at the next meeting of the City Council.

Leigh.—Proposed Loan.—The T.C. has decided to apply to the L.G.B. for sanction to the borrowing of £18,300 for extensions to the electricity undertaking; £65,713 has already been expended on the undertaking.

London.—Woolwich.—A letter has been received from the L.C.C., with regard to the B.C.'s application for a loan of £3,622 for mains, transformers, switchgear and apparatus, stating that the Finance Committee had agreed to recommend sanction to the borrowing of £3,290 only subject to Treasury approval, deducting certain expenditure which has taken place since restrictions were imposed. The Finance Committee has considered the borough electrical engineer's report as to the deficiency on the undertaking for 1914-15, and has asked for the observations of the B.C. upon the financial condition of the undertaking as disclosed by the accounts. The B.C. has decided to accept the reduced sanction, and to charge the £332 to revenue account.

The Charing Cross, West End, and City Electric Supply Co. is applying to the Board of Trade for its consent to an increase of 10 per cent. on the charges for lighting during the period of the war and for 12 months afterwards or for such period as the Board may determine.—*Standard.*

Londonderry.—According to the *Londonderry Sentinel*, at a mayoral luncheon held last week, in the course of the speeches, it was announced that the profit on the electricity department this year would be probably £2,000. The chairman of the Lighting Committee announced that the output had increased by 21 per cent. and the revenue by over 30 per cent. in 1915, as compared with 1914. The L.G.B. had sanctioned a loan for new plant, which would result in a saving of £750 a year on coal, and enable them to increase the output by 70 per cent. Through the action of a small Committee a saving of £800 had been effected in purchasing coal recently.

Maidstone.—Price Reduction.—From April 1st the charge for current for heating purposes will be reduced to 1d. per unit by the T.C.

Plymouth.—Quarterly Return.—The return of the electricity undertaking for the quarter ended December last shows that on the Prince Rock section 1,044,834 units were sold, producing an estimated revenue of £11,136 as against 888,996 units and £9,297 in the corresponding period of the previous year. At the Newport Street works 785,089 units were sold, producing £7,469, as against 718,545 units and £6,587 in the last quarter of 1914.

Portishead.—The Clevedon, Portishead and District Electric Supply Co. has applied to the B. of T. for consent to use overhead lines at Long Ashton.

Salford.—The T.C. is making application to the L.G.B. for further sanction to borrow £2,016 to cover capital expenditure in connection with the electricity undertaking in respect of loans sanctioned by the Board prior to March 12th last. Agreements are to be entered into with four firms for the supply of current. The Electricity Committee has accepted the offer of Messrs. Maden and McKeen to purchase and remove two of the existing old engine generating sets at the Frederick Road station for £2,500, also the offer of Messrs. Andrew Knowles & Sons to supply 500 tons of Trencherbone slack at 16s. 8d. per ton.

Shipley.—Price Increase.—In consequence of the increased prices of materials which are being paid by the electricity department, it has been decided that from April 1st next all charges for electricity for power purposes, not covered by special agreement, shall be advanced 10 per cent.

Stirling.—A further sum of £1,000 is to be borrowed for the purpose of defraying capital expenditure in connection with the electric lighting undertaking. The Corporation already possesses the necessary powers to borrow this sum.

Sunderland.—Price Increase.—The Electricity Committee has decided to recommend the Council to advance the charge for electricity for lighting purposes by the equivalent of a farthing per unit, commencing from April 1st.

Tasmania.—The Hobart City Council has adopted the following schedule of charges for electric power. Under Schedule A, 4s. per month per B.H.P. installed plus 1d. per unit used, with a discount of 0·4d. per unit for prompt payment; under Schedule B, 4d. per unit for the first 25 units per quarter, and 3d. per unit for all over 25 units, with a discount of 1d. per unit. Under Schedule C, the charge for connected loads of 100 H.P. up to 500 H.P., to be 4s. per month per B.H.P. installed, plus ½d. per unit used, with a discount of ¼d. per unit. The chief engineer of the hydroelectric department wrote, stating that the Government proposed for the purpose of encouraging the establishment of new industries in Tasmania, to charge half the schedule rates for electric power supplied to any new enterprises for the first 12 months, and asked if the Council was prepared to make a similar concession.—*Hobart Mercury.*

Todmorden.—Proposed Loan.—The T.C. has decided to apply for sanction to spend £2,200 on boiler plant for the electricity works.

Uruguay.—The new electric light service at Punta del Este, a seaside resort, was formally inaugurated last month.

Wimbledon.—The Electricity Committee has authorised an arrangement with Messrs. E. Brook, Ltd., for the hire-purchase of motors which might be hired to consumers in the Council's area.

The Council has approved of revised agreements for supply to the Foster Engineering Co. and Messrs. Stevenson & Sons, a coal clause being incorporated.

TRAMWAY and RAILWAY NOTES.

Australia.—A progress report by the Railway Commissioners, on the suburban railway electrification, mentions that No. 1 boiler house, with 12 boilers, stoking, ash and coal-handling appliances, are expected to be completed in a few months; a section of the condensing plant, manufactured locally, is finished, and two turbo-alternator sets are well in hand. A portion of the 20,000-volt transmission cable is in position; the Jolimont carshed is practically complete; the rolling-stock equipment is being carried out, and a commencement has been made in equipping substations. The Commissioners are unable to give any idea as to when the scheme will approach completion.

Blackpool.—It is proposed to discontinue the parcels express service on the tramway cars as from April 1st, the service, which has had 12 months' trial, not being a success.

Bradford.—As an outcome of consideration of recommendations of the Executive Council of the Municipal Tramways Association regarding the question of the indispensability of certain sections of employés on tramways, the Tramways Committee has passed a resolution: "That having regard to the severe gradients on certain sections of the Bradford tramway system the Committee deem it necessary, in the interests of public safety, that not less than one-third of the staff of male conductors be retained in the service of the department." After somewhat protracted negotiations the employés of the tramway department have accepted the offer of a war bonus equal to an increase of about 3s. a week on the old rates, but have done so under protest. The 20 women conductors are giving satisfaction, and the manager has been given authority to engage 40 more women as conductors.

Brighton Railway Electrification.—The chairman, at the recent annual meeting of the company, referred to the progress of the electrically worked suburban lines of the company, new work on which, he pointed out, had been temporarily suspended for a time, but was now being steadily carried on with a view to completing at least a part of the scheme by the time normal conditions returned.

He stated that the existing electrical services were working most satisfactorily and giving excellent results. Recent statistics showed that last year there was an increase in the number of passengers carried by those services of nearly 70 per cent. over those carried in the last years of steam traction, and since their inauguration five years ago over 40 millions more passengers had been carried by them. The increase still continued, as was demonstrated by the fact that the number carried last year was 15 per cent. higher than in 1914; this meant that there was a considerable addition to the daily suburban traffic. The contract for electrification was now in the hands of the Metropolitan Carriage and Waggon Co., and Messrs. R. W. Blackwell & Co.

Burnley.—Plant Inauguration.—To-morrow the new 6,600-volt three-phase plant, including turbine plant and a rotary converter sub-station, installed at a cost of £26,000, is to be officially started up.

Continental.—Spain.—The small horse-tramway system uniting Irun and Fuenterrabia, 5,100 metres in length, is to be electrified. The two towns have together a population of 18,000 only, but the latter town is much frequented by foreigners in the summer season.—*Industria e Invenciones.*

Croydon.—Wages.—The Tramways Committee has received a letter from the Chief Industrial Commissioner respecting an application made by the Union of Licensed Vehicle Workers in regard to wages and working conditions, asking whether the Corporation is willing to concur in the reference of the matter to arbitration. The Tramway Committee estimates that these requests would involve an additional payment in wages amounting to close on £10,000 a year. Under the circumstances, the Committee has now recommended the Corporation to inform the Commissioner that it is not willing to agree to his proposal.

Dublin.—At the annual meeting of the Dublin and South-Eastern Railway Co., Mr. P. H. Grierson suggested that negotiations be opened with the Dublin United Tramways Co., with a view to the electrification of the railway line between Dublin and Bray (Wicklow).

Glasgow.—Electric Vehicles.—It is proposed that a deputation of the Cleansing Committee of the T.C. shall visit Birmingham, Sheffield and Dover for the purpose of inspecting at work the electric vehicles now in use in those towns for refuse collection, before submitting a final proposal to the T.C.

There are now 1,180 women conductors and 25 women drivers on the Corporation tramway cars.

Leeds.—Wages.—The General Purposes Committee has decided not to recommend any further increase of the war bonus to tramway workers except in special cases; it has also decided not to alter the terms of employment of women conductors.

London.—The Board of Trade has extended the period for the exercise of compulsory purchase of lands, &c., under the London Electric Railway Act, 1913, by one year.

Newcastle-on-Tyne.—An extension of the Corporation tramway system to Benton was opened on Friday, last week, and a ten-minutes' service will be given. In connection with the above, a motor-'bus service will run from Benton to Annitsford Bridge.

North London Electrification.—Lord Rathmore, at the annual meeting of the North London Railway, stated that it was hoped by September next to work the present service between Broad Street and Kew and Richmond by means of electric trains, but probably not the more frequent service they intended ultimately to supply. The scheme forms part of the greater suburban electrification scheme of the North-Western Railway.

North Staffordshire Railway.—In the course of his speech at the annual general meeting of the above company, the chairman mentioned that the electric haulage in the Harecastle tunnel, on the company's canal system, had been working very satisfactorily indeed. The average number of boats towed by the tug was eight, and it was a question whether they would not provide a duplicate tug to ensure that traffic should not suffer from a breakdown.

South-Western Railway Electrification.—At the annual meeting of this company it was stated that the expenditure on the electrification of the suburban lines, up to the end of 1915, was £970,000. It was hoped to commence the Hounslow service early in March. Owing to the delay in the delivery of the machinery for the completion of the power house, it would probably be three or four months before the service to Hampton Court and Claygate was electrified, thus completing the present scheme. Comparing the week just prior to the opening of the "roundabout" electric service with the second week after the service commenced, there was shown an increase of 16 per cent. in the bookings.

Wolverhampton.—On Friday last, owing to the shortage of street labour, the services of the recently-formed Women's Volunteer Reserve were obtained to dig out the tramway cars which were snowed up during the previous night and day.

TELEGRAPH and TELEPHONE NOTES.

Aeroplane for Line Repairs.—An aeroplane was employed in the restoration of telephone service destroyed by the recent floods at San Diego, Cal. It carried a rope across the flooded district, and with the rope a telephone cable was hauled through the water, thus enabling a connection to be made between the broken lines.—*T. and T. Age.*

Canada and U.S.A.—Marconi's Wireless Telegraph Co. announces that deferred plain language telegrams, night, and week-end telegrams can now again be accepted for Canada and the United States.

Spain.—The Spanish authorities have seized a secret wireless station at San Felix de Guixols, in Catalonia.—*The Times.*

United States.—The Federal District Court of New York upheld on January 7th the Atlantic Communication Co., the German-American concern operating the wireless station at Sayville, L. I., in its contention that it was not infringing upon patent rights held by the National Electric Signaling Co. The suit begun against the German company was dismissed. The National Electric Signaling Co. holds patent rights to radio inventions by Prof. R. A. Fessenden, and in his opinion Judge Mayer held that certain claims in the Fessenden patents were invalid. The Court declared that Dr. Lee de Forest had worked out the musical-toned receiver to a commercial possibility, and was operating stations in New York while Fessenden was still experimenting.—*Electrical World.*

CONTRACTS OPEN and CLOSED.

OPEN.

Aberdare.—March 11th. U.D.C. Electrical stores for 12 months. See "Official Notices" February 18th.

Australia.—Sydney.—May 1st. Two 300-kw. turbo-alternators, condensers, switchboard, &c., for the pumping station at Ryde, for the Metropolitan Board of Water Supply and Sewerage at Sydney.*

May 3rd. N.S.W. Railways and Tramways Department. One 2,500-kw. turbo-alternator, for Zara Street, Newcastle, power house. Specifications (20s.) from the Engineer's office, 61, Hunter Street, Sydney.*

Barrow-in-Furness.—March 6th. Corporation. Electrical stores for 12 months. Borough Electrical Engineer.

Belfast.—March 15th. Tramways and Electricity Committee. Stores, including a number of electrical items. See "Official Notices" February 25th.

Birkenhead.—March 6th. Corporation. Cable and two rotary converters with switchgear. See "Official Notices" February 1st.

Bolton.—March 6th. Tramways Committee. Stores, including lamps, carbons, &c. See "Official Notices" Feb. 25th.

Burnley.—March 20th. Electricians' work, for the B. of G. Mr. J. S. Horn, Clerk.

Dundalk.—March 21st. U.D.C. Engine-room stores, cables, lamps, &c., for the Electricity Department. See "Official Notices" February 25th.

East Ham.—March 10th. Corporation. Twelve months' supply of engineers' sundries, for the Electric Lighting and Tramways Department. Town Clerk.

Edinburgh.—March 13th. Corporation. Structural steelwork at the new electric generating station, Portobello. Sir Alexander B. W. Kennedy, 17, Victoria Street, S.W.

Heston and Isleworth.—March 11th. U.D.C. Electrical supplies, including cables, meters, &c. See "Official Notices" February 25th.

Heywood.—March 15th. Electricity Committee. Stores, including some electrical items, for 12 months. See "Official Notices" February 25th.

Ilford.—The Tramways Manager does not think it advisable to obtain tenders this year for annual supplies. He suggests obtaining one or two prices as and when articles are required and accepting the most favourable, excepting cases where the amount exceeds £50.

London.—Kensington.—March 8th. B. of G. Six months' supply of electric fittings, lamps, &c. Clerk, Guardians' Offices, Marloes Road, W.

L.C.C.—March 10th. Asylums and Mental Deficiency Committee. Electrical sundries. Mr. H. F. Keene, Clerk, 6, Waterloo Place, S.W.

Manchester.—March 7th. Electricity Committee. Additional tanks for feed-water softener, Stuart Street station. Chief Electrical Engineer, Dickinson Street.

Newport (Mon.).—March 4th. Corporation. Twelve months' supply of stores and materials for the Electricity Committee. Mr. A. N. Moore, Borough Electrical Engineer.

New Zealand.—Dunedin.—May 17th. City Council. (1) Tramcar bodies; (2) electrical equipment. Plans, &c., from the Town Clerk, Dunedin.*

Pontypridd.—March 13th. U.D.C. Twelve months' supply of electrical stores for the Electric Light and Tramways Department. See "Official Notices" February 18th.

Salford.—March 4th. T.C. Two 1,000-KW. and one 500-KW. rotary converters and two water-tube boilers. Borough Electrical Engineer.

Spain.—The municipal authorities of Alcublas (Province of Valencia) have lately invited tenders for the concession for the electric lighting of the town during a period of 20 years.

Swansea.—March 6th. Education Committee. Electric lighting installation at Brynmill and Cwmbwrla Council Schools. See "Official Notices" February 18th.

Specifications for the items marked * can be seen at the Board of Trade Commercial Intelligence Branch in London.

CLOSED.

Australia.—The following tenders have been accepted :—

P.M.G.'s Department, Sydney.

200 miles of twisted-pair distributing wire, £3,300.—Western Electric Co. (Aust.), Ltd.
50 miles of rubber-insulated conductor wire, £478.—W. T. Henley's Telegraph Works Co., Ltd.

P.M.G.'s Department, South Australia.

30 miles of rubber-insulated tinned-copper wire, £273.—W. T. Henley's Telegraph Works Co., Ltd.

Metropolitan Board of Water Supply and Sewerage, Sydney.

Centrifugal pumps and electric motors at Marrickville, £3,614.—Gibson, Battle & Co. —*Australian Mining Standard.*

Victorian Railways.

50-ton electric overhead travelling crane, including longitudinal conductors, for Ballarat workshops, £2,160; ditto, for Bendigo workshops, £2,160; 80-ton ditto, for Ballarat workshops, £1,575; 10-ton ditto, £922; ditto, for Bendigo workshops, £927; ditto, for Ballarat workshops, £927.—Stothert & Pitt.
Half-watt lamps, lanterns, &c.—Aust. General Electric Co., and I.R., G.P. and Telegraph Works Co., at rates. —*Tenders.*

Aylesbury.—U.D.C. Fuel oil (22 tons) for the electricity works : Anglo-American Oil Co., Ltd.

Bexhill-on-Sea.—T.C. Accepted tenders :—

Fan-housing for induced-draught plant at the electricity works.—Sturtevant Eng. Co., £155.
Pump.—G. & J. Weir, £82.

Bradford.—Guardians. Recommended tender : Maintenance of electrical installation at the Hospital, £15 a quarter, Mr. Chas. Bell.

Derby.—T.C. Tenders accepted :—

Two electric omnibuses, £2,266.—Edison Accumulators, Ltd.
Coal for the electricity works.—Parr & Sons; Mr. T. Walker; Brookhouse, Johnson, Ltd.; Derby Coal Co., Ltd.; Hall's Collieries, Ltd.

Ilford.—The D.C. Electricity Committee is extending the present contracts for annual supplies for 12 months as follows :—

House-service fuse-boxes.—W. Lucy & Co., Ltd., 25 per cent. increase.
Joint-boxes.—W. Lucy & Co., Ltd., 4 per cent. increase or decrease with every 10 per cent. variation in the ruling price of pig-iron.
Incandescent lamps.—Cryselco, Ltd.; Electrical Mfg. & Supplies; and London and Rugby Engineering Co., Ltd, on present terms.
Meters.—Ferranti, Ltd., and Electrical Apparatus Co., Ltd., at present ruling prices as quoted. The B.T.H. Co. decline to enter into a contract for 12 months; orders will therefore be placed for their type of meter as required.
As regards house-service fuse boxes, no reply has as yet been received from J. H. Tucker & Co. as to whether they are willing to continue the contract or not.
Messrs. Foster & Co. are to supply 5,400 tons of Ibstock medium peas coal at 20s. 2d. per ton, and 1,500 tons each of Ibstock D.S. nuts and slack at an average price of 18s. 0½d. per ton, over a period of 12 months.

Glasgow.—The Tramways Committee recommends acceptance of the following offers :—

Galvanised-steel wire.—John Stewart & Co., Ltd.
91/18 cab tire cable.—St. Helens Cable Co., Ltd.
Tubes for canopy rods.—Stewarts & Lloyds, Ltd.
Three-core cable, ozone-proof cable, and asbestos-covered wire.—B.I. and Helsby Cables, Ltd.

Liverpool.—Recommended tenders for supply of materials for the Electric Supply Department :—

Insulated cables and wires.—Liverpool Electric Cable Co.; St. Helens Cable & Rubber Co.
Electric meters.—Ferranti, Ltd.
Carbon-filament lamps.—Edison & Swan Co.
Metallic-filament lamps.—Pope's Electric Lamp Co.
Stoneware troughing, insulators, &c.—Middleton Fireclay Works; Doulton and Co.; J. E. Beard & Co., Ltd.; Callender's Cable Co.; J. Bourne and Sons; J. Evans (Liverpool); Liverpool Building Material and Cement Co., Ltd.
Electric fittings and sundries.—Sykes & Sugden, Ltd.; British Electric Calibrated Fuse Co.
Cables and accessories for street mains.—Callender's Cable Co.
Cast-iron troughs and boxes for street mains.—Whyman's Foundry Co.
Lubricating oils.—Spurrier, Glazebrook & Co., Ltd.; Vacuum Oil Co.

For the Tramways Department :—

Iron castings.—Moston Malleable Castings Co.; National Rail & Tramway Appliances Co.; Interchangeable Brake Block Co.; Jas. Allan, sen., and Son; John Needham & Sons.
Steel gears and pinions.—F. W. Rowlands & Co.
Lubricating oils and greases.—Vacuum Oil Co.; C. C. Wakefield & Co.

London.—Islington.—Lighting Committee. Accepted tenders for annual supplies :—

Cable terminal service and network boxes, tapes, and iron castings.—Callender's Cable Co.; Lucy & Co.; Sykes & Sugden; J. Gibb & Co.; Dussek Bitumen Co.; Henley's Tel. Works Co.; I.R., G.P. and Tel. Works Co., Ltd.
Electrical sundries, lamps, &c.—Goodman & Co.; Cryselco Co.; Edison and Swan Co.
Cables.—B.I. and Helsby Cables, Ltd.
Meters.—Chamberlain & Hookham; British Westinghouse Co.
Earthenware pipes, insulators, troughs, fire bricks, &c.—Young & Sons; Turner & Lisney, Ltd.; Knowles & Co.; Doulton & Co.
Transformers and o.i. tanks.—British Electric Transformer Co.; Sheepbridge Coal & Iron Co.
Arc lamp globes.—Goodwin & Co.
Oils and lubricants.—Vacuum Oil Co., Ltd.

Manchester.—Tenders accepted by the Tramways Committee :—

J. Mackie & Son (agents for the Cornish Tin Smelting Co., Ltd.).—Block tin.
Daimler Co., Ltd.—Four motor-'bus chassis.

By the Electricity Committee :—

Strachan & Henshaw, Ltd.—One Telpher ash-handling plant.
W. T. Glover & Co., Ltd.; Chas. Macintosh & Co., Ltd.; and B.I. and Helsby Cables, Ltd.—Supplies of cable.
Newton, Chambers & Co., Ltd.—Hot-well tank and water piping.

The E.C. has consented to the substitution of the name of the British Westinghouse Electric and Manufacturing Co., Ltd., for that of Brown, Boveri & Co., Ltd. (London), as sub-contractors for a 15,000-KW. alternator.

The Gas Committee has accepted the tender of Mr. R. Carlyle, Manchester, for the erection of a power house for electrical plant.

Midland Railway Co.—Pope's Electric Lamp Co., Ltd., has secured a renewal of its contract for the supply of "Elasta" wire lamps and carbon-filament lamps to this company.

New Zealand.—The following tenders have been accepted by the Public Works Department, Wellington :—

Transformers.—Section 53, £949, India-Rubber, G.P. and Telegraph Works Co., Ltd.; Section 54, £705, and Section 55, £573, Tolley & Sons.
Insulators.—Section 56, £474, National Electrical and Engineering Co.; Section 57, £210, and Section 58, £210, India-Rubber, G.P. and Telegraph Works Co. —*N.Z. Shipping and Commerce.*

Salford.—Messrs. Maden & McKee, Liverpool, are to purchase and remove two of the old generating sets at the Frederick Road station for £2,500. Messrs. Andrew Knowles and Sons are to supply 500 tons of Trencherbone slack, at 16s. 8d. per ton, delivered.

FORTHCOMING EVENTS.

Greenock Electrical Society.—Friday, March 3rd. At 7.45 p.m. At the Temperance Institute, 19, West Stewart Street. Paper on "The Life of Sir Charles Wheatstone," by Mr. A. R. Macaulay.
Saturday, March 11th. Visit to Greenock Gas Works.

Royal Institution of Great Britain.—Friday, March 3rd. At 5.30 p.m. At Albemarle Street, Piccadilly, W. Lecture on "Corona and other Forms of Electric Discharge," by Prof. Silvanus P. Thompson, F.R.S.
Saturday, March 11th. At 3 p.m. At Albemarle Street, Piccadilly, W. Lecture on "Radiations from Atoms and Electrons," by Prof. Sir J. J. Thomson.

Salford Technical and Engineering Association.—Saturday, March 4th. At 7 p.m. At the Royal Technical Institute. Paper on "Arrangement and Efficiency of Boiler Plants," by Mr. P. D. Kirkman.

Institution of Civil Engineers.—Tuesday, March 7th. At 5.30 p.m. At the Institution, Gt. George Street, S.W. Address on "Industrial Development," by Mr. Harold Cox.

Rontgen Society.—Tuesday, March 7th. At 8.15 p.m. At the Institution of Electrical Engineers, Victoria Embankment, W.C. Discussion on "The Injurious Effects produced by X-rays." Paper on "The use of Inverse Current," by Mr. A. C. Gunstone.

Association of Engineers-in-Charge.—Wednesday, March 8th. At 8 p.m. At St. Bride's Institute, Bride Lane, E.C. Paper on "Lubrication in Practice," by Mr. H. W. Pretty.

Royal Society of Arts.—Wednesday, March 8th. At 4.30 p.m. At John Street, Adelphi, W.C. Paper on "Optical Appliances in Warfare," by Mr. C. R. Darling.

Institution of Electrical Engineers.—Thursday, March 9th. At 8 p.m. At Victoria Embankment, W.C. Paper on "Continuous-current Railway Motors," by Mr. E. V. Pannell.

(**Manchester Local Section**).—Wednesday, March 8th. Joint meeting with the Liverpool Engineering Society. At the Royal Institution, Colquitt Street, Liverpool. Paper on "The Modernising of an Electric Power Supply Undertaking," by Mr. E. M. Hollingsworth.

(**Yorkshire Local Section**).—Wednesday, March 8th. At 7 p.m. At the Philosophical Hall, Leeds. Paper on "Hire and Maintenance of Continuous-current Motors," by Mr. H. Joseph.

Manchester Association of Engineers.—Saturday, March 11th. At the Grand Hotel, Aytoun Street. Paper on "India-rubber and Balata Belting as Conveyer and Power-transmission Belts," by Mr. J. Tinto.

NOTES.

The Batti-Wallahs' Society.—In spite of the bad weather, a hundred Batti-Wallahs and their friends gathered together at the Victoria Mansions Restaurant for an informal evening on Friday last. Lieut. Haydn T. Harrison (president) was in the chair, and Mr. W. Rigg (past president) was deputy chairman. A large proportion of the assembly were clad in either blue or khaki. One of the party, Major Spittle, late of the G.W.R. electrical department, had only the previous evening returned from Flanders on short leave. One of the chief features of the programme was the Batti-Wallah Band, an original turn arranged by Mr. F. J. Collis, assisted by Messrs. Ireland, Beevor and Hornby.

Institution and Lecture Notes.—Petrol, Steam and Electric Vehicles.—A paper on the above subject was read recently by Mr. G. Martin Gamble before the Yorkshire Association of Students of the Institution of Civil Engineers, at Sheffield. The author referred to the increased daily radius of motor as compared with horse transport, pointing out the saving in handling of goods by the use of the latter in preference to the railway for short distances. As regards steam traction, he mentioned that the time taken in raising steam, withdrawing or banking fires and replenishing water tanks was equal to 50 10-hour days a year.

The paper contained statistics showing comparative estimated running costs, the figures including standing charges, interest 5 per cent. per annum, depreciation and insurance, but not management and establishment charges. Thus a rubber-tired petrol wagon of 2 tons capacity, on the basis of 40 miles a day would cost 8·7d. per mile run; a 3-ton wagon, 40 M.P.D., 11·2d.; a 4-ton wagon, 40 M.P.D., 11·7d.; a 5-ton wagon, 40 M.P.D., 12·8d. A rubber-tired steam wagon of 3 tons capacity, 35 M.P.D., would cost 10·6d. per mile run; and a 5-ton wagon, 30 M.P.D., would cost 13·9d. As against these figures, the author estimates the cost of operating a 2-ton electric vehicle 30 and 50 miles per day at 10·1d. and 7·8d. per mile run respectively; a 3½-ton vehicle, 45 M.P.D., at 10d.; and a 5-ton vehicle, 35 M.P.D., at 12·8d. per mile run.

Electric vehicle makers' estimates, comparable with the foregoing, show, for a 1½-ton vehicle, 32 M.P.D., 8·8d. per mile run; 2-ton vehicle, 40 M.P.D., 5·7d. and 5·1d. (two makers); 3½-ton vehicle, 40 M.P.D., 7·13d., and 45 M.P.D., 6·69d. (two makers); 5-ton vehicle, 35 M.P.D., 9·5d., and 40 M.P.D., 8·45d. per mile run (two makers). Figures of cost per ton-mile were also given, based on the data given above. The author admits the difficulty of producing really comparative data.

Institution of Electrical Engineers.—The special general meeting of corporate members, to consider the proposed alteration of the articles of association, for the purpose of excluding alien enemy members, was held on Wednesday last; the attendance was unexpectedly large, and included many members from provincial centres. The President moved the resolution, which was seconded by Mr. C. A. Baker. An amendment extending the scope of the resolution to all members of alien enemy origin was ruled out of order, on the advice of the hon. solicitor; other questions were raised with regard to the case of naturalised aliens who had not denaturalised themselves in their native country, with regard to the possibility of giving every member an opportunity to vote by means of a postal ballot, and with regard to the permanency of the exclusion after the war. The adjournment of the meeting was also moved, but not accepted by the President, and complaints were made that the meeting was farcical if no amendments could be considered. The President, who emphatically repudiated a suggestion that the Council was pro-German, explained that any change in the articles must first receive the approval of the Board of Trade, hence the impracticability of dealing with amendments to the resolution, which had been approved by the Board. The discussion was very animated, and several members who supported the resolution intimated that if it did not apply to naturalised aliens who had omitted to become denaturalised at home they would vote against it. On the other hand, it was pointed out that if the resolution were rejected a totally erroneous impression would be created outside the Institution, as the sense of the meeting was unmistakably in favour of the exclusion of alien enemy members. Eventually it was decided that the resolution should not be put to the meeting, but that a new meeting should be called, at which the resolution and amendments could be fully considered and a satisfactory resolution formulated, which would then be submitted to the Board of Trade for approval. The session occupied about 1½ hours.

Institution of Civil Engineers.—On Tuesday next the members will receive an address on "Industrial Development," by Mr. Harold Cox. In inviting Mr. Cox to address the Institution on this subject, the Council states, it considered that the present time calls for some earnest attention on the part of engineers to the economic issues which, after the war, must influence profoundly the future of engineering, as well as the industrial and commercial enterprises which are vital to its progress, both in this country and abroad.

Association of Mining Electrical Engineers.—In the course of a paper on "Some Coal-Cutting Difficulties," read at a meeting in Glasgow of the West of Scotland Branch of the Association, Mr. H. T. Mackinnon suggested that as coal-cutters demanded intelligence and experience in their operation, machine men when first engaged should be brought to the electrical engineer-in-charge for examination as to their ability to discharge the work. Experience had shown that there was no other class of machinery more certain to yield a return for its proper maintenance or to exact so severe a penalty for its neglect than the coal-cutter of the modern type. He emphasised the necessity for standardising plugs for machines and gate-end boxes.

The Yorkshire Branch of the Association, on Saturday last, paid a visit to the Frickley Colliery, South Elmsall, by permission of the Carlton Main Colliery Co., whose engineer, Mr. H. Elliott, prepared a paper describing the colliery and its plant.

Tramways and Light Railways Association.—The Association has decided to hold its Congress on Friday, June 30th, in order not to clash with the annual Conference of the I.M.E.A., which is provisionally fixed for Thursday and Friday, June 22nd and 23rd.

Volunteer Notes.—Engineering Institutions' V.E.C.—Orders for week commencing March 6th, 1916.—By Lieut.-Col. C. B. Clay, V.D., Commanding.

Drills, 6.25 to 7.25; 7.25 to 8.25 p.m.

Monday, March 6th.—Sections 1 and 2, Technical; Sections 3 and 4, Lashings and Trestle Bridging, Signalling Class and Recruits.

Tuesday, March 7th.—School of Arms, 6 to 7 p.m.

Thursday, March 9th.—Shooting for Sections 1 and 2, and Signalling Class.

Friday, March 10th.—Sections 3 and 4, Technical; Sections 1 and 2, Lashings and Trestle Bridging; Signalling Class and Recruits.

Saturday, March 11th.—Uniform Parade, 2.45 p.m.

At the Parade on Saturday, March 11th, members will parade with the 4th Batt. Central London Regiment, and will proceed by train to Woldingham, where they will be given an opportunity of inspecting the trench digging now being carried on there.

Members wishing to stay in camp on March 11th at Woldingham must give in their names at once.

E. G. Fleming,
Company Commander and Acting Adjutant.

3rd Batt. (Old Boys) Central London Volunteer Regiment.—Battalion Orders by Capt. R. J. C. Eastwood (Commandant), Thursday, March 2nd, 1916:—

Week-end Parades.—Saturday.—The Battalion will parade at Wembley Park at 3.15 p.m. under Company Commanders.

Sunday.—First Sunday in the month—The Battalion, less North London Platoon, will parade at Wembley Park, at 10.45 a.m. for Field Operations. The North London Platoon will be attached to the 4th Batt. Herts. Volunteer Regiment, for these operations.

Mr. W. Ridd will be in command of the Battalion for these manœuvres. The Commandant and Adjutant are appointed Umpires.

Musketry.—There will be shooting at Bisley on Saturday next, the 4th inst. Members to Parade, in uniform, at 12.45 p.m., Waterloo Station, Platform No. 6, and to report themselves to Sergeant Cotter.

There will be no shooting at Acton.

A. G. Joiner, *Major and Adjutant*, O.B.C.

Appointments Vacant.—Chief assistant engineer (£200), for the Wallasey Corporation electricity department; shift engineer (£2), Borough of Rawtenstall electricity department. See our advertisement pages to-day.

Cedes Electric Traction, Ltd.—The petition of the Tudor Accumulator Co., Ltd., for the winding up of this company has been allowed to stand over for a fortnight.

A 2,000-KW. Motor-Generator.—There has recently been installed at station C of the Pacific Gas and Electric Co., Oakland, Cal., a 2,000-KW. motor-generator set, consisting of an 11,000-volt, three-phase, 60-cycle synchronous motor and a 275-volt, 2,000-KW. shunt-wound, commutating-pole generator.

To carry the full-load current, which is about 8,000 amperes and provide sufficient radiating surface, the commutating field poles were wound with soft annealed copper strips wound on edge and connected in parallel. It was impracticable to use solid conductors, because a cross-section of 8 sq. in. was required. On account of the current which had to be commutated and the high peripheral speed of the commutator the bars had to be arch-bound midway between each end by three shrink rings of high tensile strength. Both ends of the commutator, are bored to a slight taper and rest on similarly tapered steel rings held together by bolts. This construction allows the commutator bars to expand lengthwise when heated without distorting the shape of the commutator. On account of the length of the commutator a brush-holder yoke is placed midway of it and the brush forks are attached so that they extend towards each end. Even with this construction they are relatively long, so the forks were made of cast-iron to give rigidity and copper-plated to improve their conductivity.

All parts of the brush rigging are made comparatively heavy to absorb the small vibrations set up by the 250 brushes in the commutator. Box-type brush-holders are employed, which are split through the centre and hinged on one side, so that any holder can be removed without disturbing the others.

Each armature conductor consists of eight square wires in parallel, insulated from each other to reduce eddy current loss, which would be considerable with solid conductors of the cross-section required. The coils are insulated with mica, fish paper and cotton tape, which are hot-pressed and impregnated with an oil-proof and moisture-proof compound. Deflectors are attached to the front end of the commutator and the rear ends of the armature to force air past the current-carrying parts.

Although the rotating element of the set weighs 46 tons, only two bearings are used. Each pedestal is provided with a large oil reservoir, with openings to permit the circulation of air for cooling. The bearings are ring-oiled, but to ensure an adequate supply of oil the flooding system is used. Small gear pumps, belted to the shaft, carry oil from the reservoirs in the pedestals to the tops of the bearings.

This motor-generator set, while rated at 2,000 KW., occupies a floor space of only 13½ ft. by 21 ft., which is but slightly more than the space occupied by the 1,000-KW. sets of the same speed previously installed in the same station.—*Electrical World.*

Swansea Electrical Showroom. — Through the courtesy of Mr. Burr, the borough electrical engineer, we are enabled to illustrate the palatial showroom recently opened by the Swansea Corporation electricity department. The premises which face the gas company's showrooms in the centre of the town, were originally used as a bank, and contain three large rooms, one of which—the showroom—we illustrate, while the others are used as a demonstration room and inquiry office respectively. It is proposed to hold weekly demonstrations in cooking, for which object

Photo: Chapman, [*Swansea.*

SWANSEA ELECTRICAL SHOWROOM.

two lady assistants have been engaged; the room for this purpose accommodates 60 people. As stated in a previous issue, the showroom was opened by Col. Sinclair, chairman of the Electricity Committee, who pointed out that the chief object to be attained was to demonstrate to consumers, existing and prospective, the advantages of electricity in its various applications.

Re Adnil Electric Co., Ltd.—The creditors and shareholders of the ADNIL ELECTRIC CO., LTD., Adnil Building, Artillery Lane, Bishopsgate, E.C., against which a winding up order was made in October last, met on February 29th, at the Carey Street offices of the Board of Trade, Lincoln's Inn, W.C. Mr. H. E. Burgess, Official Receiver, reported that the company was registered in 1909, and was really a revival or reconstruction of a previous concern, entitled Marples, Leach & Co., Ltd.; it was formed for the purpose of picking up that business, then in the hands of a liquidator. It appeared that Marples, Leach & Co., Ltd., had been in existence for five years, but then failed owing some £7,500 on debentures and £24,000 to unsecured creditors. The greater part of the debts were due to the Bergmann Elektricitäts Werke, of Berlin, and under the liquidation of Marples, Leach and Co., the Bergmann Co. provided cash with which to pay off the debentures in full and to give the unsecured creditors a dividend of 7s. 9d. in the £. The Adnil Co. was then registered and purchased the stock of Marples, Leach & Co. from the liquidator. There was also some talk of a contract to purchase the goodwill of that business, and in the books of this company the Bergmann Co. was credited with £6,000 in respect of such goodwill, for the reason, apparently, that the Bergmann Co. were almost the only creditors of Marples, Leach & Co., Ltd. That sum of £6,000 was included in the present liabilities of this company, but in the absence of any contract or supporting document it could not be admitted to rank with the other debts. The nominal capital of the Adnil Co. was £10,000, divided into £1 shares; the whole of it had been issued, and with the exception of two holders of one share each the lot was held by the Bergmann Co., who accepted 7,300 shares in payment for goods supplied, and provided cash in return for the remainder. The company traded during the first two years of its existence at a small loss, but since then at a profit. During the year ended June, 1912, a profit of £638 was made, and in the following year the profit was £1,025, out of which a dividend of 5 per cent. was paid. Only a small profit was made during the year ended June, 1914.

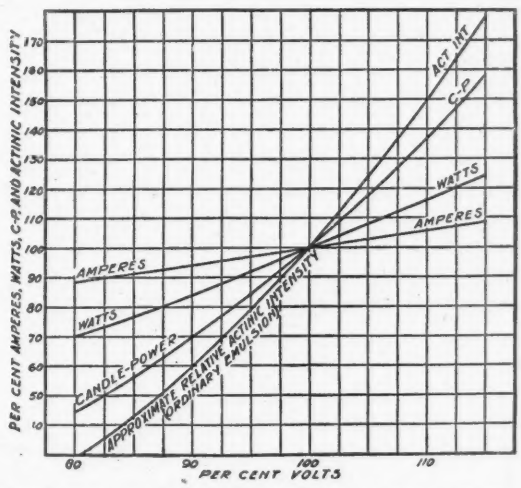
The chairman added that this company was really an agency in England for the Bergmann Co., and it followed that, as soon as war was declared, supplies from the parent company were stopped, and no valid reason remained for the existence of the Adnil Co. The trading and business automatically stopped, but certain of the creditors intimated that they were prepared to continue operations on certain lines. Accordingly, Messrs. Marples & Leach, who had acted as managers, undertook the responsibility of the future trading, and were to take stock from the Adnil Co., and pay them one-third of the gross profits on the further trading, the other two-thirds going to Messrs. Marples & Leach respectively. The company had, however, received the whole of the profits, and Messrs. Marples & Leach had a claim in respect of their shares thereof. The winding-up order was not made against the company until October, 1915, although the petition was filed in the preceding July, and a provisional order was made for the Official Receiver to take charge of the concern and protect the assets of the company pending the hearing of the petition. Soon after that order was made, with a view to carrying on the business, and collecting the large amount of book debts, Mr. J. H. Stephens, chartered accountant, 6, Clement's Lane, Lombard Street, E.C., was appointed special manager. He had previously been appointed, under the Trading with the Enemy Act, to supervise the business. An offer was received by Mr. Stephens from Mr. Leach to take over the stock at the price of £4,843, payable by instalments extending over two years. It followed that the liquidation must extend over that period. A statement of affairs had been drafted showing liabilities of £33,000, but from that had to be deducted the £6,000 before referred to as owing to the Bergmann Co. in respect of the goodwill, thus reducing the indebtedness to £27,000. Then, with regard to assets, Mr. Stephens had collected altogether £16,949, and after deducting necessary payments for carrying on the business, he had a balance of £12,092 now in hand. There were further book debts, amounting to £10,000, to be collected, and they were expected to fetch £4,500; there was also a balance of £4,200 to come from Mr. Leach for the stock, so that the total realisation could be estimated at £20,792, or, roughly, after deducting expenses, at £20,000, to be distributed amongst creditors for £27,000, who would probably receive rather more than 13s. 4d. in the £.

A creditor inquired whether a considerable sum was owing to alien creditors, and in the event of those claims being disregarded, the English creditors would not receive 20s. in the £.

The Official Receiver pointed out that although it was the usual custom abroad to settle with home creditors in full before taking English claims into account, the law in England provided that all creditors, whether home or abroad, should share alike. In this case the moneys due to German or other alien creditors would be handed over to the Public Trustee, who would hold them until the conclusion of the war.

A resolution was passed for Mr. J. H. Stephens to remain in charge of the liquidation.

Over-Run Gas-Filled Lamps in Photographic Work.—As shown by the accompanying performance curves for gas-filled tungsten lamps, the C.P. and the actinic intensity of the light increase much faster than the power demand when the voltage across a given lamp is increased above the normal operating pressure. For instance, with a 10 per cent. increase in voltage above the rated value, the actinic intensity increases 50 per cent. Con-



PERFORMANCE OF GAS-FILLED LAMPS, SHOWING EFFECT OF VOLTAGE ON C.P. AND ACTINIC INTENSITY.

tinuous operation at such an over-voltage would decrease the lamp's life from 1,000 hours to about 300 hours, but momentary over-voltage operation may not be objectionable in portrait or motion-picture photography, as the posing may be performed at reduced intensity, and the lamp later flashed to 110 per cent. of its rated voltage only at the time of film or plate exposure.—*Electrical World.*

Supply Companies in France.—Apart from the dearness of other raw materials, the supply companies in France, which depend upon the use of coal, are seriously affected by the high price of the latter, owing to the national production being largely in enemy possession, and the enormous rise in freight rates since the outbreak of war having caused imported coal to reach an unprecedented level. At the recent meeting of the Société d'Electricité de Paris, the chairman mentioned that the company had to arrange contracts for English coal months in advance, in order to endeavour to obtain regular deliveries, that the company had to keep stocks amounting to about 30,000 tons, and that the present cost of the coal was from £2 16s. to £3 4s. per ton. Naturally, the augmentation brings about automatically a similar increase in the charges made per KW.-hour where it is possible to secure it. But it is asserted that certain supply companies are specially affected through the dearness of coal, as their contracts with consumers are for the sale of energy at a fixed price, that is, at the same rate as prior to the war, and, as prices are already low, many supply companies are now declared to be working at a loss at the present time. This state of affairs, however, does not prevail in the case of

the Société d'Electricité de Paris, whose principal customers are the Metropolitan Railway, the Nord-Sud Railway, the Compagnie des Tramways de Paris et du Departement de la Seine, and the Compagnie des Omnibus. The contracts with these customers and the large industrial consumers are arranged on a double basis. In the first place, the price is fixed according to the consumption of energy, and it is based upon the average price of coal in the previous year. Later on, when it is possible to ascertain the average prices of coal in the current year, the accounts are adjusted accordingly. In normal times the variations in the prices of coal are only slight, and the adjustments of accounts are consequently limited to sums amounting to a few thousands of francs; but at present the variations in coal prices are enormous, and the adjustments represent several millions of francs which customers will have to pay to the company. The necessity for accumulating large stocks of English coal, which has to be paid for in cash, imposes a great charge upon the financial resources, and in order to keep adequate funds in hand the date for the payment of the company's dividend for 1914-15 has been left to the discretion of the directors. In Italy, where in times of peace imported coal cost £1 4s. per ton, the rate rose recently to £8 per ton, but since then a slight decline has taken place. The supply companies and the tramway authorities are particularly affected detrimentally not only on account of the high price of coal, but also owing to its scarcity. Some of the tramway companies are restricting their services, whilst others will be compelled to stop working altogether if the situation is not speedily remedied. A meeting of representatives of the tramway and lighting companies has just been held, when it was decided again to impress upon the Government the urgent necessity for taking action in the matter, especially as the State is a very large purchaser of English coal for the railways and other purposes.

Engineers' Wages.—The *Manchester Guardian* states that the Joint Committee of Engineering and Kindred Trades representing the Manchester district met in Manchester on 23rd February. Mr. T. J. Holt, district secretary of the Amalgamated Society of Engineers, presented the figures of the ballot dealing with the decision of the Government Productions Committee regarding the application for an increase of wages to engineers in the district. The result showed an overwhelming majority in favour of carrying the question forward. Another application is to be made to the Manchester Engineering Employers' Federation. The original application was for a wages advance of 6s. per week. The local conference and the central conference declined to accede to the claim, and the Government Productions Committee took the same course. It is stated that an amended application is now being forwarded to the Employers' Federation, as the men are determined that the Manchester district shall be brought up to the standard of other centres. For the men it is stated:—"Hitherto we have been one of the highest-paid engineering centres in the country, but to-day we are one of the lowest. The wages of the past have drawn the cream of the craftsmen to this area, and, naturally, the prestige must be maintained. In Manchester we have only had a 3s. wages advance since the war began. Other towns have received from 5s. to 7s. of a wages advance, and others again a 4s. wages advance with a 3s. war bonus."

Inquiry.—Makers of "Metite" brushes for slip-rings are asked for.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The following increases of salary to officials in the Manchester electricity department were to be brought before the City Council on Wednesday of this week:—

Mr. T. Baxendale, constructional engineer and assistant resident engineer at Stuart Street, from £270 to £300 per annum; Mr. J. R. Davidson, boiler-house superintendent, running staff, £200 to £225; Mr. H. W. Smyth, engineer-in-charge, Stuart Street, £200 to £225; Mr. W. H. Woods, engineer-in-charge, Stuart Street, £200 to £220; Mr. W. H. Simpson, engineer-in-charge, Stuart Street, £200 to £220; Mr. A. L. Lunn, engineer-in-charge, Stuart Street, £175 to £200; Mr. J. G. Thomson, boiler-house superintendent, repairs staff, £175 to £200; Mr. W. Baxter, superintendent of electrical repairs at all stations and sub-stations, £156 to £175; Mr. W. Kidd, assistant constructional engineer, £163 16s. to £200.

Out of 52 applicants, five of whom were interviewed, Mr. T. E. Boothby, of Wembley, Middlesex, has been appointed as charge engineer at the Southwark electricity works, at a salary of £3 a week. Mr. W. E. Buckingham has been appointed junior engineer. There were 15 applicants for this post, five being selected for interview, but two only putting in an appearance.

Mr. E. W. Martin, assistant distribution engineer at Woolwich, is to be promoted to the position of distribution engineer (a post formerly filled by Mr. Penning, the present deputy electrical engineer) at a commencing salary of £170 a year. It is proposed to increase Mr. Penning's salary from £235 to £250.

Mr. J. S. Hollinrake, electrical engineer to Bispham-with-Norbreck U.D.C., has been appointed manager to the Weaverham Electricity Supply Co., Ltd., Cheshire.

The employés at the Kilmarnock Corporation electricity works have presented Mr. E. J. Walsh, chief assistant engineer, with a purse of sovereigns on his departure to take up the duties of resident engineer to the Musselburgh Electric Light & Tramway Co. The presentation took place at a function held last Friday, presided over by Mr. Neil Clark, works superintendent, and Mr. W. E. Upton, assistant engineer.

Mr. R. W. Klitz, assistant electrical engineer of the Wimbledon B.C., has been granted a commission as Lieutenant in the Army Ordnance Department.

General.—On Saturday evening about fifty employés and friends of the firm of G. R. Marson gathered at the "Craven Arms" Hotel, Coventry, for a social evening at the invitation of the firm. The manager, Mr. J. Marson, was in the chair. During the evening Mr. W. Chatwin, an employé of the firm for 20 years, on behalf of the other employés of the firm, presented to Mr. J. Marson a gold match-box for himself, a gold chain and pendant for Mrs. Marson. A musical programme followed.

The India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd., of Silvertown, have lost another of their old servants in the person of Mr. Robert Stables, who recently retired on account of ill-health after 43 years' service. Mr. Stables who was born in 1850, joined the India-Rubber Co. in 1873, and in two or three years was made engineer-foreman. In 1884 he was appointed manager of the rubber department, which eventually came under the control of Mr. C. H. Gray, one of the present managing directors. Mr. Stables took a great interest in local affairs, and a few years ago was elected Deputy-Mayor of West Ham. An artistic illuminated address (into which a rubber tree and the Silvertown Co.'s house flag were introduced), together with a cheque, was presented to Mr. Stables as a token of the high esteem in which he is held by his many friends at the works, at Cannon Street, and at the branches. Owing to the present state of Mr. Stables's health, two of his former colleagues, Messrs. G. Stoat and J. Hipwell made the presentation at his home at the Garden City of Letchworth, Herts., to which he recently removed.

Mr. M. A. McLean, of the British Westinghouse Electric and Manufacturing Co., Ltd., Trafford Park, is serving on the Stretford Appeal Tribunal.

Amongst the candidates selected by the Council of the Royal Society to be recommended for election into the Society is Mr. S. G. Brown.

Mr. Ewart V. Baldwin, for the past eight years with the Newcastle Electric Supply Co., has secured a commission in the Royal Engineers, and has joined the Electrical Section.

At St. John's Church, Chatham, on February 24th, the marriage took place of Mr. Leonard Wallis, of the electrical engineering staff at the shipbuilding yard of Messrs. Palmer, Newcastle-on-Tyne, and Miss Margaret T. Coltman.

Mr. D. A. Walker, draughtsman in the Wimbledon B.C. electricity department, who joined the London Scottish Regiment at the outbreak of the war, and was wounded in France, losing one of his eyes, returned to his duties in the department on January 31st, on his discharge from the Army. He has now resigned his position, having obtained another appointment.

Roll of Honour.—Second-Lieutenant R. B. Dunlop, Royal Engineers, reported a second time wounded, was formerly in the service of Messrs. Siemens at Glasgow.

Mr. J. Bayldon, late of the 2nd Battalion Scots Guards, electrical storekeeper at Northfleet Engineering Works, died on February 17th. He took part in much fighting until wounded at Ypres, and was invalided out of the Army.

Private Andrew Quick, late of the staff of the Gravesend and Northfleet Electric Tramways, Ltd., and of the 2nd Bedfordshire Regiment, has been killed in action in France.

Sergeant Francis L. Cater, who was gazetted Second-Lieutenant on February 18th, returned home ill, and is in hospital at Hastings.

Second-Lieutenant E. A. F. Goodfellow, 3rd Connaught Rangers, who was killed on February 20th, was the only son of Mr. and Mrs. A. T. Goodfellow; he was educated at Eton and the Central Technical College, South Kensington, where he was Siemens medallist and David Salomons scholar, and obtained diplomas in electrical engineering and in civil and mechanical engineering. He graduated B.Sc.Eng. (hons.) at London University, and became assistant engineer of the Burma Railways, but came home in April last and obtained a commission. He was said to be "a tremendous worker."

Wills.—The late Colonel T. E. Vickers (Vickers, Ltd.) left unsettled net personalty amounting to £106,899.

The late Mr. Thomas Parker left £13,380 gross and £6,096 net personalty.

The late Mr. J. H. Lane, a director of the Indian Government Telegraph Department, left £28,842 gross and £26,307 net personalty.

NEW COMPANIES REGISTERED.

Baughan and Co., Ltd. (143,116).—This company was registered on February 25th, with a capital of £2,500 in £1 shares, to carry on the business of electrical, general, and consulting engineers, as formerly carried on by A. H. V. Baughan at London Street, Reading, as Baughan and Co. The subscribers (with one share each) are: G. B. Hextall, 36, King Street, Cheapside, E.C., solicitor; F. Sawyer, 46, Fairmile Avenue, Streatham, S.W., clerk. Private company. A. H. V. Baughan is first permanent governing director. Registered office: 8 and 10, London Street, Reading.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Musselburgh and District Electric Light and Traction Co., Ltd.—A memorandum of satisfaction to the extent of £600 on December 15th, 1915, of charge dated November 13th, 1905, and May 11th, 1909, securing £90,000, has been filed.

Rugby Lamp Co., Ltd.—Issue, on January 26th, 1916, of £500 debentures, part of a series of which particulars have already been filed.

White, Jacoby and Co., Ltd. (52,494).—Capital, £4,000 in £1 shares. Return dated December 23rd, 1915. 3,207 shares taken up; £1 per share called up on 850 shares; £850 paid; £2,357 considered as paid on 2,357 shares. Mortgages and charges: £1,380.

British Electrical Export Co., Ltd. (138,028).—Capital, £2,000 in £1 shares. Return dated January 5th, 1916. 103 shares taken up; £103 paid. Mortgages and charges: Nil.

City of Freetown (Sierra Leone) Electricity Co., Ltd. (138,058).—Capital, £1,000 in £5 shares. Return dated January 31st, 1916. All shares taken up; £1,000 paid. Mortgages and charges: Nil.

National Electric Engineering Co., Ltd.—Capital, £5,000 in £1 shares. Return dated January 3rd, 1916. 2,659 shares taken up; £654 paid; £2,005 considered as paid. Mortgages and charges: Nil.

Bogota Telephone Co., Ltd. (69,059).—Capital, £45,000 in £1 shares (20,000 pref. and 25,000 def.). Return dated November 26th, 1915. 18,200 pref. and 18,607 def. shares taken up; £1 per share called up on 9,200 pref. and 18,607 def. shares; £27,807 paid; £9,000 considered as paid on 9,000 pref. shares. Mortgages and charges: Nil.

Bourne End Electric Installation Co., Ltd. (98,428).—Capital, £5,000 in £1 shares. Return dated December 30th, 1915. 1,000 shares taken up; £7 paid; £993 considered as paid. Mortgages and charges: £2,000.

CITY NOTES.

French Electrical Companies.

The Compagnie Générale Francaise de Tramways proposes to pay a dividend of £1 per share for 1915, as compared with 16s. in 1914; the Tramways de Rouen £1 4s. per share, or 6 per cent., for 1915; and the Tramways d'Amiens 5 per cent., as against 4 per cent. in 1914.

The accounts of the *Société Hydro-Electrique des Basses Pyrénées* for 1914 show an increase in the receipts as compared with the preceding year, but the inconsiderable profits have not permitted of the payment of a dividend. The situation of the undertaking improved in 1915, owing to the demands for power on the part of local works engaged on the production of war materials.

The *Société Est-Lumière, of Paris*, reports that the receipts in 1914-15 experienced a decrease simultaneously with a growth in the working expenses owing to the war, and the number of new consumers, which exceeded 23,000 in 1913-14, increased by scarcely 2,000 in the past year; whilst the consumption of old customers was much less than formerly. After several years of progressive expansion, the gross receipts in 1913-14 reached £215,000, and the gross profits £89,000, the figures for the past year being £182,000 and £49,000 respectively. The net profits receded from £74,000 in 1913-14 to £29,000, but no dividend has been paid for either year, as the company is reserving its funds for the purpose of development works.

The report of the *Société d'Electricité de Paris* for the year ended with June 30th, 1915, states that the period included the first 11 months of the war, when industrial depression was the most marked, and it only experienced slightly the effects of the resumption which is growing month by month, and is tending to increase the sales of energy to the transport companies and large manufacturers in the vicinity of Paris. Under the prevailing circumstances, the works carried out at the Saint Denis station were of little importance, and no addition was made to the supplementary installations and accessories. The sales amounted to 85,510,000 KW.-hours, as contrasted with 145,213,000 KW.-hours in 1913-14, and the net profits reached £105,000, permitting of the payment of a dividend of 8 per cent., or 16s. per share.

The *Société L'Ouest-Lumière*, which made regular progress year by year down to the outbreak of the war, suffered from this event and the advance in the cost of coal and of other raw materials. While the number of new customers increased by 16,000 in 1913-14, that in the following year scarcely rose by 2,000, but the company has the good fortune of possessing in its area of supply many industries which are working for the national defence, and which are expected to be transformed after the war, especially in the case of the many new works, so as to produce articles formerly procured from Germany. The gross receipts in 1914-15 amounted to £240,000, as compared with £335,000 in the previous year, and the net profits were £65,000 and £124,000 respectively. A dividend at the rate of 2s. 9d. per share has now been declared for each of the past two years, this contrasting with 5s. 7d. per share in 1912-13.

The directors of the *Société L'Eclairage Electrique, of Paris*, report that the Lecourbe works, which was disorganised at the beginning of the war through the withdrawal of mobilised workers, was not brought to a standstill, but continued the construction of machinery and executed important deliveries either from stock or from manufacturing. The work carried out at the cable factory at the Jarville works was the production of wire, whilst conductors and cables were made at the works in the Rue Bolivar. In the case of the Colombes works, which was closed on the opening of the war, work on copper was resumed in October, 1914, together with the production of tubes and small appliances, which were in great demand. The works in the Avenue de Choisy was very actively occupied, and received large orders for electrical plant and lathes. The net profits realised in 1914-15 amounted to £42,000, and a dividend at the rate of 5 per cent. has been declared.

Chelsea Electricity Supply Co., Ltd.

The profit for 1915 was £34,955, plus £3,111 brought forward and £2,312 for interest. After paying debenture interest and redemption fund, putting £14,720 to credit of reserve for renewals, depreciation, and contingencies, writing off £1,089 for cost of extinction of founders' shares, writing £1,000 off investments, paying 6 per cent. on the preference shares, and 4 per cent. on the ordinary for the year, £3,293 is to be carried forward. 5,564 lamps (equiv.) were added during the year, making the total 319,840. The units sold were 4,192,892, a decrease of 149,290 for the year. Annual meeting: March 8th.

Underground Electric Railways Co. of London, Ltd.

The net revenue from investments, &c., in 1915, after deducting general expenses, and including the amount brought forward, was £707,370. After paying 4½ per cent. on the bonds due 1933 and on the three-year secured notes due 1917, the surplus is £580,618. This is dealt with thus:—Payment under the guarantee on Central London Railway assented stocks, £26,931; interest at 6 per cent. on first cumulative income debenture stock due 1945, £76,380; interest at 6 per cent., plus income-tax, on 6 per cent. income bonds due 1948, £438,731, leaving £38,576. The income from investments was £680,741, as against £684,626 for 1914, a decrease of £3,884, or .57 per cent. Notwithstanding the abnormal conditions resulting from the war, the aggregate income from all sources was well maintained. Annual meeting: March 10th.

British L. M. Ericsson Manufacturing Co., Ltd.

During 1915 the business of the company continued to show most satisfactory results. The net profit, after charging £11,882 for depreciation, and £2,500 for debenture interest, is £22,593, plus £7,023 brought forward. After paying the preference dividend, £9,000 is to be put to reserve, 8 per cent. (free of income-tax) is to be paid on the ordinary shares, the same as for 1914, carrying forward £6,616. The death is recorded of Mr. P. G. Wayne, a director, but the vacancy is not to be filled up at present. Annual meeting: March 15th.

Davis & Timmins, Ltd.

Sir Henry Mance, addressing the annual meeting on February 24th, said that the report from the financial point of view was highly satisfactory, but the results were in a great measure due to abnormal conditions due to the war. They must not expect that at the conclusion of hostilities they would immediately return to the normal state of things existing before the war. Business relations would take some time to re-adjust themselves. In regard to the Excess Profits Tax, the exact amount that they would have to pay was not yet ascertained, as no doubt the Government would require to see that the accounts were prepared in exact accordance with their views. It was, however, certain to exceed £10,000. Mr. G. E. Davis, the managing director, who followed, said that they had had to work hard and long to secure the year's results. A year ago he said that no man could tell what the difficulties of obtaining supplies of metal, &c., used in their manufactures might be in the near future, and that applied even more so to the conditions that obtained to-day. No supplies could be obtained except against cash in advance, and that meant that a big bank balance was needed. Their order-book was naturally congested, and they were anxious to cause their regular customers as little inconvenience as possible.

Charing Cross, West End & City Electricity Supply Co., Ltd.

The directors report to the following effect for 1915 (the figures in parentheses are for 1914):—

West End Undertaking.—Gross earnings, £138,964 (£142,086); expenses, excluding depreciation, £70,068 (£69,677); net earnings, £68,895 (£72,409), plus £18,000 brought forward, interest accrued for 1915 £2,978, and transferred from general reserve (income) £6,000. The available total is £95,873. Out of this, debenture interest requires £17,829, depreciation £22,000, preference dividend £18,000, and 5 per cent. is paid on the ordinary shares, the same as for 1914, carrying forward £18,044. There are now connected to the mains in the West End 718,028 (equiv.) lamps, as follows: Lighting, 458,345; heating, 36,572; 223,111 (8,982 H.P.) in motive power. Units generated, 5,934,552; bought, 8,454,628; sold, 11,440,835; used on works and in transmission and distribution, 2,948,345. Public lamps, 303; units sold for public lighting, 313,638.

City Undertaking.—Gross earnings, £158,357 (£153,689); expenses, £94,590 (£86,983); net earnings, £63,767 (£66,706), plus £18,000 brought forward. The available total is £81,767. Out of this, £30,459 is required for interest on debenture

stock, loans, and advances, the preference dividend absorbs £18,000, £15,308 is put to general reserve (income) account, leaving £18,000 to carry forward. There are now connected to the city mains 722,700 (equiv.) lamps, as follows: Lighting, 321,675; heating, 57,516; motive power, 343,509 (13,814 H.P.). Units generated, 29,631,120; bought, 172,554; sold, 24,034,857; used on works, &c., 5,768,817.

Oxford Electric Co., Ltd.

The profit for 1915 was £13,340, including £1,055 brought forward. Debenture and other interest requires £2,016, there is written off hire-purchase installations £686, 5 per cent. is paid on the pref. shares, and 6 per cent., less income-tax, on the ordinary, £1,000 is put to reserve and plant renewal account, and £968 is carried forward. The demand for light decreased owing to the war, and the heavy cost of fuel also adversely affected the revenue. Mr. E. A. Beavers has been elected a director in place of the late Prof. T. L. Bullock. Annual meeting: March 7th.

Torquay Tramways Co., Ltd.

For 1915 the profit was £13,691, and after deducting debenture charges there remains £6,511, plus £897 brought forward. To reserve and renewals £2,500 is put, 3¼ per cent. (the same as last year) is paid on the ordinary shares, and £914 is carried forward. The traffic revenue fell from £28,414 to £28,070, the passengers carried from 4,366,227 to 4,293,177, and the car miles run from 627,140 to 620,756. The average receipts per car mile fell from 10.87d. to 10.85d., but the average receipts per passenger increased from 1.56d. to 1.57d., and the cost of energy per car mile from 1.83d. to 1.91d. At the annual meeting held on February 11th, the chairman, Mr. W. B. Cownie (who presided in the absence of Mr Schlesinger through illness) said that the result was a good testimony to the stability of the undertaking. The receipts this year so far showed an increase of £253 over those to the same date last year. Under the agreement with the Corporation it was provided that when the market price of suitable coal exceeded 20s. per ton, the price of current could be increased by agreement, or by an amount to be settled by arbitration. The Corporation had intimated that they intended to charge an extra ¼d. per unit, which they considered grossly excessive; arbitration would, therefore, probably be resorted to. If the price awarded by the arbitrator materially affected their costs, they would have to re-arrange their services and stages. The total operating cost per car mile run was 6.09d., against 6.36d. in 1914. The chairman expressed appreciation of the services of the manager, Mr. H. J. Nisbett, and his staff. A number of women conductors were at work and giving entire satisfaction.

Newcastle-on-Tyne & District Electric Lighting Co., Ltd.

At the annual meeting on February 25th, Dr. J. B. Simpson said that during the year third mortgage debentures for £30,000 were issued to provide for the erection of new plant at Newburn, which came into operation at the beginning of the year; that plant had enabled them to reduce the works costs. Loans had increased by £39,395, the money having been expended in erecting plant to supply energy for power purposes. This plant had only recently been put into commission, and it would further reduce the works costs. The capital expenditure during the year was £48,817. As they were unable to obtain delivery of full quantities of coal contracted for, they had to purchase coal in the open market, and it had adversely affected the profits. To meet the additional costs the price for energy supplied to ordinary customers was raised as from the June quarter meter readings. The total gross receipts for electrical energy showed an increase of £9,301 over 1914. The loss of receipts due to lighting restrictions was £3,700, but this had been compensated for by the increased demand for power. The net profit for the year was £15,965, an increase of £555. In view of the exceptional circumstances due to the war, and the uncertainty of what was before them, the directors decided that it would not be wise to recommend the payment of a dividend, believing that in these times a cautious and conservative policy was essential.

London Electric Supply Corporation, Ltd.

Mr. R. H. Benson, presiding at the annual meeting on February 24th, said that after his warning of last year regarding the setback which was inevitable during war-time owing to the price of coal and restricted lighting, they would not be surprised to see that, while the gross revenue broke the record at £213,964 against £191,196, the net revenue was only £77,687, against £93,234. Owing to the higher coal and wages costs, the cost per unit sold was nearly ¾d. instead of ½d. The present net revenue had only been twice exceeded. This year the amount put to reserve was double the amount paid in dividend. He wished it were more, but it was a substantial amount against the risk of purchase in 1931. In anxious time when there was less profit, the work and responsibility of the staff were hardest. They could realise what a trying thing it had been to generate and sell 50,757,584 units, against 46,343,065 in 1914, under war conditions, with depleted staff and irregular supplies of indifferent coal, requiring careful selection and sorting. Special thanks were due to Mr. Partridge and the staff, and to the managing director. But for the war they would have had a record year—£20,000 more net revenue, or even more. He must not predict now as to the future; they had just got to keep things together as best they could, and so be ready when peace came to supply their customers as usual. Mr. R. Stewart Bain, the managing director, followed with the usual technical particulars. The capital expenditure of the year was chiefly for a new battery of boilers and accessories, and the laying of five miles of new mains, principally for industrial power, which continued satisfactorily to increase. The total H.P. of motors connected was 15,683 H.P., and contracts for a further 1,500 H.P. had been received. The receipts were up by nearly £23,000, and the expenditure by over £38,000 (coal accounted for over £30,000 of that, and the balance was increased wages, both due to the war). They consumed 90,000 tons of coal at 19s. 9d. per ton, as against 73,000 tons at 14s. 1d. in the previous year. There had been great difficulty in getting deliveries owing to shortage of steamers, and the bulk had been delivered by rail. It had been of an inferior quality, which meant larger quantities at greatly increased prices. The difficulty of obtaining an adequate supply of coal had not diminished since the last meeting. While the cost per unit sold increased from 0.50d. to 0.64d., the average selling price advanced from 0.94d. to 0.96d.

Westminster Electric Supply Corporation, Ltd.

Mr. J. Browne Martin, presiding at the annual meeting on February 23rd, said that they had had to contend with many adverse causes, and shareholders would be prepared for reduced profits. The normal expansion of business had naturally been checked, and they had suffered considerably from the lighting restrictions. Rigid lighting economy had been practised by many consumers. The total output showed a slight increase, but the revenue decreased by £4,080. This was due to the large increase of 1,040,000 in units sold for power, heating, and cooking, whilst those sold for lighting were less by 750,000. Some of the generating costs had risen appreciably; distribution costs were much the same as last year. Carbons for street lighting cost more by £700, as before the war they came from Germany. Fortunately, the company held a large stock, so that the full effect was not felt in 1915. This year there would be at least a further £1,000 increase. An increase of £738 in management expenses was due to extra wages owing to enlistment of so many of the staff. They had set aside £23,500 to depreciation, as against £30,868 in 1914, in accordance with the recommendation of Sir A. B. W. Kennedy, the engineer-in-chief, who reported to the board on the matter some time ago. In the early days of the company they put very little aside to depreciation, but as soon as the revenue was sufficient they increased the sum to make up for the deficiency in the early years. This had now been made good, and they would henceforth be able to reduce the rate. The fund now amounted to £316,000, the whole of which had been provided out of revenue. They had reviewed the whole of their investments, and set aside out of revenue £2,500 to provide against losses on realisation. That practically agreed with the ascertained loss on the investments realised during the past year. They had sold some of their American securities, and offered others on loan to the Treasury. The proceeds had been invested in War Loan and Treasury Bills, which together aggregated upwards of £70,000. In December, 1914, and March, 1915, they considered the question of raising charges to consumers, but decided not to do so then. In June last, however, they received a notice increasing the assessment, and they were faced with much heavier charges for coal and increased wages, and reluctantly they raised the price by 10 per cent., so that the shareholders should not carry the whole of the burden. The increase took effect in the last quarter of the year only. Owing to the uncertainty of the coal supply, special arrangements were made for storing large quantities, and this had increased the cost per unit generated. Having failed to obtain any substantial relief from the Assessment Committee, they were appealing to Quarter Sessions. Their chief assistant engineer, Mr. C. O. Grimshaw, had been occupied with important duties under the Metropolitan Munitions Committee. They had lost a colleague from the board in Mr. Hayes Fisher, who had been appointed to the post of Parliamentary Secretary to the Local Government Board. They did not propose at present to fill the vacancy. Mr. Hordern, their manager, was serving as a Commander in the Royal Navy. Their mains superintendent, Mr. W. A. Jones, was with the Forces in Egypt, and nearly all eligible men had been attested. They had 97 employés (roughly one-third) on active service—one had been killed, another was missing, ten had been wounded, and three were sick in hospital. It had been difficult at times to carry on the work of the company efficiently in all departments. The Chairman alluded to the death of Mr. Frank Iago, who resigned the secretaryship after 27 years' service last August. Mr. W. A. Pearman, who had been their accountant for 20 years, had been appointed to succeed him. The meeting passed a vote of thanks to the special constables who had guarded the company's premises.

Jarrow & District Electric Traction Co., Ltd.—The revenue for 1915 was £8,855, an increase of £986. After deducting expenses, also debenture charges, putting £800 to renewals, there remained £2,911, plus £1,026 brought forward. Of this, £900 is to be put to reserve, 4 per cent. is to be paid on the ordinary shares, and £1,040 carried forward. Annual meeting: March 6th.

Fife Tramway, Light and Power Co.

At the annual meeting, in Edinburgh, Mr. Wm. Low said the Dunfermline and District Tramways Co. had paid over to this company by way of dividend and management fees £13,650, compared with £15,250 for 1914. An extension of time in which to build certain tramways had, after a very stiff opposition, been granted. Regarding the power and lighting business, the growth had been quite satisfactory, but all properties of this kind had been hard hit by increased costs, particularly in fuel. Fortunately, they carried out large extensions during 1913 and 1914, which enabled consumers to be supplied and current to be generated more economically. The total revenue received from the Fife Electric Power Co. and the electric lighting undertakings as dividends, profits, and fees amounted to £13,567, an increase of £2,291, which was satisfactory. The additions to the power station plant had been completed. Regarding the revenue to be anticipated from the combined properties during the current year, short of some entirely unforeseen contingency, there should be a net result rather better than that of last year.

South London Electric Supply Corporation, Ltd.—The gross receipts in 1915 were £54,782, and the expenditure was £27,553. Including £2,899 brought forward, £30,127 is available. After placing £6,248 to depreciation, paying debenture and other interest, also 6 per cent. pref. dividend, 5 per cent. is to be paid on the ordinary shares, leaving £3,010 to be carried forward. There were added 25,652 new lamps (900 kw.), making the total 366,518 (12,820 kw.). The units sold were 6,318,140, an increase of 164,899. Units generated, 7,926,950. Annual meeting: March 7th.

Tyneside Electrical Development Co., Ltd.—For the year ended January 31st the profit was £2,602, plus £3,427 brought forward. After paying 6 per cent. per annum on the preferred ordinary shares, 10 per cent. on the deferred ordinary shares, and transferring to general reserve £1,000, £3,654 is to be carried forward. The balance of the amount now unpaid on the preferred ordinary shares during 1916 is to be called up.

New York Telephone Co.—Year 1915: Telephone earnings, $77,748,217 ($3,836,159 inc.); telephone expenses, $60,114,877 ($2,372,479 inc.); net telephone earnings, $17,533,340 ($1,463,680 inc.); other income, $1,877,200 ($7,806 inc.); total net earnings, $19,510,540 ($1,471,486 inc.); interest charges, $4,049,103 ($21,971 inc.); balance, $15,461,437 ($1,449,515 inc.); dividends declared (8 per cent.), $10,008,579; balance to surplus and reserves, $5,452,858 ($1,449,515 inc.). —*Financial News.*

Telegraph Construction and Maintenance Co., Ltd.—The accounts for 1915 show a net profit of £108,707, after charging the interest on the debentures, plus £111,406 brought forward, making £220,114. In addition to the interim dividend of 5 per cent., the directors propose to distribute a further dividend of 10 per cent., together with a bonus of 12s. per share, free of income-tax, and to put to reserve fund £20,000, leaving £110,474 to be carried forward.

Stock Exchange Notice.—The Committee has ordered the undermentioned to be quoted in the official list:—

Bombay Electric Supply & Tramways Co., Ltd.—Further issue of 12,000 ordinary shares of £10 each, fully paid, Nos. 120,001 to 132,000; and £10,000 5 per cent. second mortgage debentures of £100 each, Nos. 2,001 to 2,100.

County of London Electric Supply Co., Ltd.—The directors recommend a final dividend on the ordinary shares at the rate of 9 per cent. per annum, less income-tax, making 7 per cent. for the year, the same as for 1914. £40,000 has been placed to reserve for depreciation, leaving £14,000 to carry forward.

Northallerton Electric Light and Power Co., Ltd.—At the annual meeting on February 23rd, the directors reported a net profit of £496, which is to be credited to reserve. £500 was written off plant for depreciation.

City of London Electric Lighting Co., Ltd.—After placing £50,000 to reserve and paying 6 per cent. on the preference shares, and 8 per cent. on the ordinary shares (as against 9 per cent. for 1914), £17,500 is to be carried forward.

Metropolitan Electric Supply Co., Ltd.—The directors recommend a final dividend at the rate of 2 per cent., making a total of 3 per cent. for 1915, as against 3½ per cent. for 1914, placing £27,000 to reserve, and carrying forward £4,978.

Calcutta Electric Supply Corporation, Ltd.—The units sold to consumers during the four weeks ended January 28th were 1,354,635, compared with 1,022,022 in the corresponding four weeks of 1915.

Tramways, Light and Power Co., Ltd.—Including £1.712 brought forward, the receipts for 1915 were £32,213. After meeting debenture charges and paying 6 per cent. pref. dividend, £3,348 is to be carried forward.

Automatic Telephone Manufacturing Co., Ltd.—A dividend of 4 per cent. on the ordinary shares for 1915, writing off £11,500 and carrying £6,774 forward, is announced. For 1914 the dividend was 3 per cent.

Lancashire United Tramways, Ltd.—For 1915 the traffic receipts were £90,578; miscellaneous receipts and electrical energy sold produced £6,249. Less working expenses £54,933, cost of generating electrical energy sold £4,096, general charges, £5,240, rent of leased lines £5,191. Add dividend on holding in New St. Helens and District Tramways Co., Ltd., £1,534, making profit of combined undertaking £28,901. The interest and dividends received from the operating companies together with sundry receipts, amounted to £14,017. After deducting interest on prior lien debenture stock and expenses, there remains £198, which has been carried to depreciation account. There is also a balance on the year's working of the operating companies, after payment of interest and dividends beforementioned, of £16,203.—*Financier.*

Electro Bleach and By-Products, Ltd.—For 1915 the profits, after allowing for depreciation, &c., are £25,574. After charging debenture interest and writing 20 per cent. off the preliminary expenses a net profit of £22,924 remains. The directors recommend a dividend of 7 per cent. on the ordinary shares, placing £4,000 to reserve, and carrying forward £722. The profit is below expectations owing to the war and failure to obtain delivery of new plant.—*Financial Times.*

Mackay Companies.—Quarterly dividend of 1¼ per cent. on the common shares is announced.

STOCKS AND SHARES.

Tuesday Evening.

Until the new War Loan is out, markets are bound to be more or less under the shadow of its coming. The buying of the 4½ per cent. issue has ceased, and there is a general slackening of prices in other investment departments. At the same time, the tone round the markets is one of confidence and steadiness. The frenzied battles round Verdun are taken as an omen of the German onslaught at its apex; and, this having been repulsed, there is much satisfaction at the result of a movement which must have cost the enemy terrible toll in life and munitions. So that where dulness is perceptible in prices, it may be ascribed to the coming of the new War Loan, a King Charles' Head that will probably have a knack of getting into Stock Exchange reports until the terms of the issue are actually known.

The City of London Electric Lighting Co. has declared a dividend of 10s. a share, making 8 per cent. for the year, as against 9 per cent. paid for 1914. This is a slight disappointment, because most people had been expecting the company to repeat its previous performance. There was a small decline in the price of the shares upon the announcement; it is argued, however, that 8 per cent. in these difficult days is an achievement by no means despicable.

The County of London Electric Supply Co. declares a dividend of 9 per cent., making 7 per cent. for the year, and so maintaining its previous rate. This came up to expectation, as foreshadowed here already; the price of the shares has risen ¼ to 10⅜. There is not a great deal doing in the other Metropolitan issues; but, the dividends being out and the worst known, it seems that there is rather a tendency for people to buy electric lighting shares again, and quite possibly the market may now slowly recover.

Gossip has it that matters are none too peaceful on the board of one of the electric light companies concerned with the supply of current for power and lighting purposes. One section of the board is understood to favour the adoption of such a price for current as would probably check any widespread demand for it, while others take a more liberal view and point to the prices being obtained by kindred companies as the best criterion to measure what customers would be likely to pay. There may be likely scenes at one of the meetings to be held in the near future, and the outcome is awaited with a good deal of interest.

In the railway market there is very little fresh of interest. If anything, the tone is heavy as a whole. The reports have now been issued by the various companies concerned in the Underground group; and while they mostly show good results, progressive in character, there is nothing sufficiently startling in them to attract the attention that leads to buying. Underground Electric income bonds are amongst the popular stocks for the time being, no doubt in consequence partly of the fact that the present quotation carries £3 net interest; the price will be ex this interest on Wednesday. The shares fluctuate spasmodically, and both kinds show improvements this week.

Globe Telegraph ordinary strengthened ½ on the declaration of the usual quartely dividends of 3s. on the preference and 2s. on the ordinary, payable on March 31st. The market for telegraph issues as a whole is steady, falls of ½ in Western Telegraph ordinary and ½ in Anglo-American preferred being associated with a little selling on behalf of deceased accounts. Eastern ordinary lost ½, but Great Northern Telegraphs are an equal amount to the good. The Government's price for New York Telephone bonds is lower at 100¾, or 104 for dollar bonds. Callenders lost their 5s. rise of last week, and Henley preference were marked down to 4.

Mexican industrial issues are lower, and further falls have occurred of two or three points in the common shares and the bonds of the Mexico Tramways and the Mexican Light

and Power Companies. Curiously enough, there is still a demand for Mexican Railway issues; but the utility descriptions some of the holders are trying to sell, rather than join the committee that has been formed for the protection of the bondholders, the obvious reason for such attempted selling being that the proprietors have lost both hope and patience. Anglo-Argentine Tramway 5 per cent. debenture stock is easier, and Brazil Tractions fell to 51 on the course of the exchange being unfavourable to holders. British Columbia Electrics are dull.

The Public Trustee, as executor for a deceased holder of £12,960 income securities of the British Electric Traction Co., has appealed against a reduction of the B.E.T. capital; and the case came before the Court on Monday. The counsel in support of the appeal pointed out that the resolutions in favour of the reduction in capital had been validly passed, and demurred to the statement of the Master of the Rolls that the company appeared to have had a disastrous record. The hearing was adjourned for further evidence on behalf of the company.

Copper shares are a little irregular, after having been in the ascendant in consequence of the sensational rise in the price of metal. The rubber share market is one of the best in the Stock Exchange, as it is certainly the busiest. Upon a recovery in the price of the material to 3s. 9d. per lb., a fresh impetus was given to buying of the shares; and the appetite of the public for investment varieties appears to be as keen as ever.

The following is our representative list of securities connected with the various electric markets:—

SHARE LIST OF ELECTRICAL COMPANIES.

Home Electricity Companies.

	Dividend 1914.	Dividend 1915.	Price Feb. 29, 1916.	Rise or fall this week.	Yield p.c.
Brompton Ordinary	10	—	7½	—	£6 13 4
Charing Cross Ordinary	5	5	3⅝	—	7 2 10
do. do. do. 4½ Pref.	4½	4½	3⅝ xd	—	6 13 4
Chelsea	5	4	3⅔	—	6 13 4
City of London	9	8	11⅞	— ⅛	6 14 9
do. do. 6 per cent. Pref.	6	6	10½	— ½	5 14 8
County of London	7	7	10⅝	+ ½	6 15 0
do. 6 per cent. Pref.	6	6	10½	—	5 17 8
Kensington Ordinary	9	7	6	—	7 10 0
London Electric	4	3	1¼	— ⅛	7 18 0
do. do. 6 per cent. Pref.	6	6	4½	—	7 1 2
Metropolitan	3½	3	2⅜	— ⅛	8 4 8
do. 4½ per cent. Pref.	4½	4½	8	—	7 10 0
St. James' and Pall Mall	10	8	5⅞ xd	—	8 18 10
South London	5	5	3⅛	—	6 8 0
South Metropolitan Pref.	7	7	1⅞	—	6 14 0
Westminster Ordinary	9	7	5⅞ xd	—	6 1 9

Telegraphs and Telephones.

	Dividend, 1914.			
Anglo-Am. Tel. Pref.	6	100	— ½	6 0 0
do. Def.	33/6	21⅛	—	7 14 3
Chile Telephone	8	6⅜	—	6 5 6
Cuba Sub. Ord.	5	7⅝	—	6 9 0
Eastern Extension	7	13⅜	—	*6 5 0
Eastern Tel. Ord.	7	1⅛	— ⅛	*6 5 6
Globe Tel. and T. Ord.	6	10⅜	+ ⅛	*6 10 6
do. Pref.	6	10	—	6 0 0
Great Northern Tel.	22	34½	+ ½	6 7 6
Indo-European	13	49	—	6 15 4
Marconi	5	14⅜	—	5 8 1
New York Tel. 4½	4½	100⅞	+ ⅜	4 9 4
Oriental Telephone Ord.	10	14⅛	—	5 18 6
United R. Plate Tel.	8	5⅛	—	*7 19 0
West India and Pan.	1	⅛	—	9 10 6
Western Telegraph	7	12½	— ⅛	*6 5 0

Home Rails.

Central London, Ord. Assented	4	68	—1	5 17 8
Metropolitan	1½	22½	— ⅛	4 7 0
do. District	Nil	15⅞	+ ½	Nil
Underground Electric Ordinary	Nil	1⅛	+ 1/16	Nil
do. do. "A"	Nil	6/8	+9d.	Nil
do. do. Income	6	85	+ ½	*8 2 0

Foreign Trams, &c.

Adelaide Sup. 6 per cent. Pref.	6	4⅞ xd	—	6 3 1
Anglo-Arg. Trams, First Pref.	5½	4⅝	—	6 13 6
do. 2nd Pref.	5½	8½	—	7 17 2
do. 5 Deb.	5	78⅛	—1	6 7 5
Brazil Tractions	4	51	—1	6 17 3
Bombay Electric Pref.	6	10 xd	—	6 0 0
British Columbia Elec. Rly. Pfce.	5	55	—	9 1 10
do. do. Preferred	—	37	—	Nil
do. do. Deferred	—	34	—	Nil
do. do. Deb.	4½	64	—	6 12 10
Mexico Trams 5 per cent. Bonds	—	40	—2	Nil
do. 6 per cent. Bonds		25	—2	Nil
Mexican Light Common	Nil	22	—3	Nil
do. Pref.	Nil	35	—3	Nil
do. 1st Bonds	—	42	—	—

Manufacturing Companies.

Babcock & Wilcox	14	2⅜	—	5 6 8
British Aluminium Ord.	5	22/-	—	4 19 0
British Insulated Ord.	15	10⅜	—	6 19 6
British Westinghouse Pref.	7½	44/-	—	6 16 4
Callenders	15	11½	— ½	6 10 5
do. 5 Pref.	5	4½	—	5 17 8
Castner-Kellner	20	8⅛	—	6 8 0
Edison & Swan, £3 paid	Nil	7/-	—	Nil
do. do. fully paid	Nil	1½	—	Nil
do. do. 5 per cent. Deb.	5	60	—	8 6 8
Electric Construction	6	14/9	—8d.	8 1 6
Gen. Elec. Pref.	6	9⅝	—	6 4 8
Henley	20	14	—	*8 3 0
do. 4½ Pref.	4½	4	— ½	5 12 6
India-Rubber	10	9½	—	*12 19 0
Telegraph Con.	20	87	—	*7 8 6

* Allowance made for dividends being paid free

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, March 1st.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	1/4	..
a Ammoniac Sal	,,	£70	..
a Ammonia, Muriate (large crystal)	per ton	£54	..
a Bisulphide of Carbon	,,	£23	..
a Borax	,,	£28	£3 inc.
a Copper Sulphate	,,	£48	£3 inc.
a Potash, Chlorate	per lb.	1/3	..
a ,, Perchlorate	,,	2/-	6d. inc.
a Shellac	per cwt.	96/-	20/- inc.
a Sulphate of Magnesia	per ton	£18	..
a Sulphur, Sublimed Flowers	,,	£14	£1 inc.
a ,, Lump	,,	£9	..
a Soda, Chlorate	per lb.	1/4½	..
a ,, Crystals	per ton	60/-	..
a Sodium Bichromate, casks	per lb.	10d.	1d. inc.
METALS, &c.			
c Brass (rolled metal 2' to 12' basis)	per lb.	1/4½ to 1/4⅔	⅛d. inc.
c ,, Tubes (solid drawn)	,,	1/5 to 1/5½	⅛d. inc.
c ,, Wire, basis	,,	1/4⅝ to 1/4¾	⅛d. inc.
c Copper Tubes (solid drawn)	,,	1/6½ to 1/7	..
g ,, Bars (best selected)	per ton	£148	£5 inc.
g ,, Sheet	,,	£148	£5 inc.
g ,, Rod	,,	£148	£5 inc.
d ,, (Electrolytic) Bars	,,	£137	£2 inc.
d ,, ,, Sheets	,,	£155	£2 inc.
d ,, ,, Rods	,,	£144	£2 inc.
d ,, ,, H.C. Wire	per lb.	1/5	1/20d. inc.
f Ebonite Rod	,,	3/-	..
f ,, Sheet	,,	2/6	..
n German Silver Wire	,,	2/3	..
h Gutta-percha, fine	,,	6/10	..
h India-rubber, Para fine	,,	3/2	½d. dec.
i Iron Pig (Cleveland warrants)	per ton	83/-	11/5 dec.
l ,, Wire, galv. No. 8, P.O. qual.	,,	£23	£2 inc.
g Lead, English Pig	,,	£33 15	£1 inc.
g Mercury	per bot.	£16 15	..
e Mica (in original cases) small	per lb.	6d. to 3/-	..
e ,, ,, ,, medium	,,	3/6 to 6/-	..
e ,, ,, ,, large	,,	7/6 to 14/- & up.	..
d Silicium Bronze Wire	per lb.	1/8½	2½d. inc.
r Steel, Magnet, in bars	per ton	£85	..
g Tin, Block (English)	,,	£192	£8 inc.
n ,, Wire, Nos. 1 to 16	per lb.	2/9	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

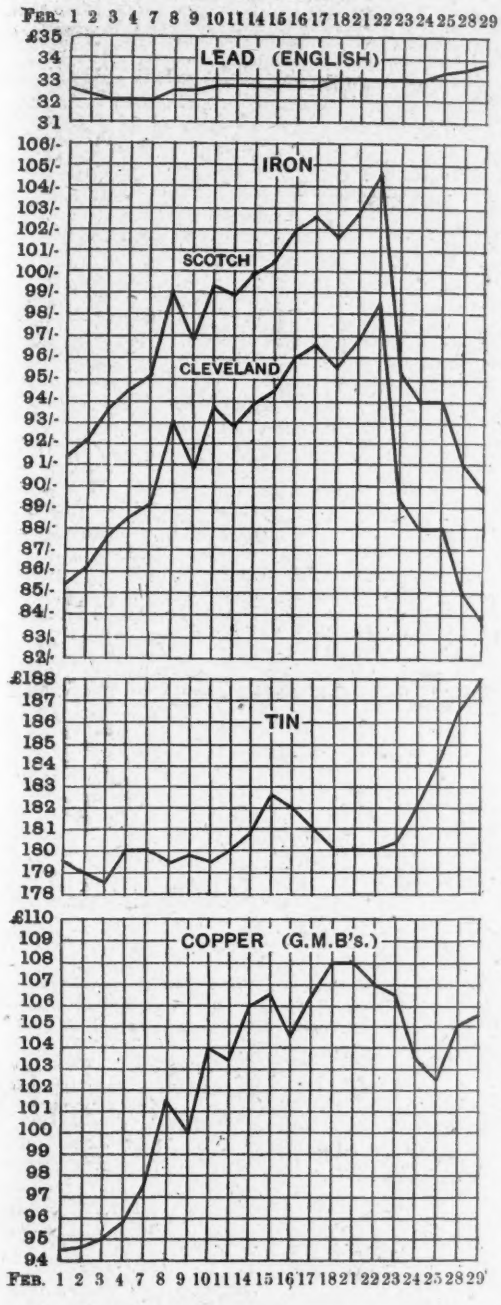
Rule-of-Thumb in Percentages.—A contributor to the *Electrical World* has made the remarkable discovery that the approximate rule that "the resistance of copper increases 1 per cent. for each 2½° C. of temperature increase" works only one way—*i.e.*, given the resistance hot, you cannot find the resistance cold by *deducting* 1 per cent. per 2½° C. of temperature drop—and hammers the point home to the readers of our contemporary in some 50 odd lines. Similarly we may point out, in illustration of the same discovery, that if his article had been 100 per cent. longer, it would merely have been doubled in length, whereas if the double-length article were made 100 per cent. shorter, nothing would be left of it but the headlines!

We may suggest that the interesting fact that $-a$ squared is always $+ a^2$, whilst the square root of $+ a^2$ is not necessarily $- a$, might usefully form the subject of a further contribution to our contemporary's pages.

Miners' Safety Lamps.—The Home Secretary has called the attention of makers of miners' electric safety lamps to two accidents with electric lamps of an approved type which occurred in December last, due to ignition of celluloid. While the lamps were in use underground, a quantity of dense smoke was evolved inside them, and in one case such pressure was developed as to burst the lamp open. In the other case the lamp did not burst, as it was not tightly screwed up, and the pressure was relieved by the gas escaping. On subsequent examination and experiment it appeared that the accidents were due to the loose spring terminals with which the lamps were fitted. These had been accidentally bent over, and had come into contact, with the result that the accumulator was short-circuited, and the heat thus generated was sufficient to decompose the celluloid of the accumulator case. In order to prevent the occurrence of accidents of this kind in future, the Secretary of State has decided to prohibit the use in approved miners' electric safety lamps of spring terminals liable to be bent over, and a general provision to this effect will be included in the next Safety Lamp Order to be made shortly. Any electric lamps at present in use which are fitted with such terminals should accordingly be refitted at once with rigid terminals. This has already been done by the maker of the type of lamp with which the accidents occurred.—*Colliery Guardian.*

METAL MARKET.

Fluctuations in February.



Electrolytic Zinc Plant.—The success of Anaconda's experiments in the production of electrolytic zinc is definitely settled by the announcement that a $2,000,000 plant is to be constructed at Great Falls, where cheap electric power is available. Research on this subject has been under way for months, and will now culminate in a plant that is to be in operation about September of this year. The reported capacity is 70,000,000 lb. per annum, and the power requirement 30,000 H.P. Zinc concentrate will be roasted and leached with sulphuric acid; the solution will then be purified by precipitating iron by means of limestone and copper and cadmium by zinc. The purified zinc sulphate solution will then be electrolised with insoluble lead anodes and either aluminium or zinc cathodes.—*Met. and Chem. Engineering.*

Electric Steel.—The Apollo Electric Steel Co., U.S.A., which has just been organised, has ordered from the Snyder Electric Furnace Co., of Chicago, two 12-ton single-phase furnaces, each of which will have a daily output capacity of 100 tons of steel. The new steel concern plans to market high-grade steel in the shape of bars, billets and special products. Electrical energy from the lines of a near-by central station company will be used to operate most of the company's machinery.—*Electrical World.*

THE RESISTANCE OF A CUBE.

By A. J. Makower, M.A.

In the issue of February 4th, of the Electrical Review, a reference is made to the indeterminate nature of the problem of finding the resistance between diagonally opposite corners of a cube made of sheets having a resistance of one ohm a side. It was suggested that as the resistance of a side depends on the manner in which the current enters and leaves, the resistance of the side should be defined as referring to the case in which the current flows uniformly from edge to edge. The following considerations show that a more convenient assumption is that the resistance of each side should be defined as the resistance of a side from corner to corner.

If a square sheet be connected by its corners to a source of electric current the stream lines will be of the nature shown in fig. 1. The symmetry shows that the resistance of the square between A and B is the same as the resistance, under the conditions of

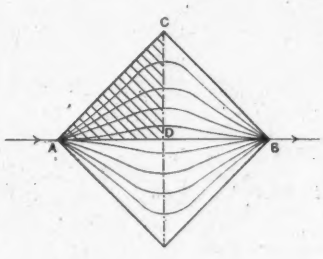


Fig. 1.

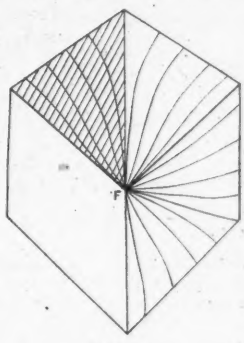


Fig. 2.

flow, of the shaded area between the point A and the side C D, as the complete resistance is made of a parallel arrangement of two circuits each consisting of two areas in series similar to the shaded area. If we now consider the case of the cube and look at it from a feed-point F, as shown in fig. 2, it will be seen by symmetry that the stream lines in every face will be the same, and that the stream lines in the shaded areas of figs. 1 and 2 will correspond. Now, the resistance of a given shape of a given sheet-metal is independent of its actual size, and thus we may

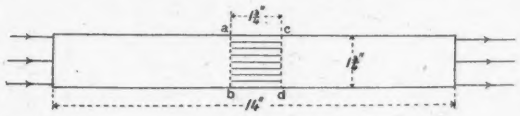


Fig. 3.

determine the resistance of a cube in terms of the resistance of a square sheet of the metal between corners as defined in fig. 1, or, what is the same thing, in terms of the resistance of the shaded area of fig. 1. The cube consists of two portions, similar to the portion viewed in fig. 2, connected in series. Each of these portions consists of six areas similar to the shaded area in parallel. Thus the cube will have a resistance of two-sixths or one-third of the resistance of one of the shaded areas, or, in other words, *the cube will have between its diagonally opposed corners a resistance of one-third the resistance of a square sheet of the metal measured between its diagonals.*

The simplicity of this rule follows from the fact that the stream lines are similar in the two cases compared, but if the resistance of the cube were referred to that of a square between its edges, the different nature of the stream lines in the two cases would cause the relation to be much more difficult to determine.

In order to corroborate the above reasoning, a cube with 6-in. sides was made of a sheet of tin of No. 22 S.W.G. gauge. Before cutting up the sheet the resistance of an 18-in. square, measured between corners as in fig. 1, was found to be 0.00174 ohm. The sheet was then cut up and formed into a cube, and the resistance was found to be 0.000546 ohm, which is near enough to one-third of the value, 0.00174 ohm, to confirm the law given.

It is interesting, in view of the reference made above to the resistance between opposite edges, to state that the resistance of a square sheet of the material used was determined between its edges by feeding a strip at six points, as shown in fig. 3, and measuring the current taken and the voltage drop between the lines *ab* and *cd*. In this arrangement, the stream lines in the small central square are practically uniform, as shown by the lines drawn. The resistance of the square was found to be 0.00026 ohm, or 0.15 times that of the square fed at its corners. Using this figure, we see that the resistance of the cube between diagonally opposed corners will be $2\frac{1}{4}$ times that of one of its sides measured between opposite edges, instead of two-thirds of that resistance, as given in the issue referred to.

It is not simple to solve the problem of the diagonally fed square mathematically, but very close results may be obtained by graphical methods. If the stream lines be drawn in directions that seem to be reasonable, and the area be divided up into a number of nearly rectangular areas by the stream lines and the equipotential lines normal thereto, the resistance of the area can be predetermined with a fair degree of accuracy. The writer has obtained a value agreeing with the test values within 10 per cent. by dividing the area into about 120 small rectangles in the above-described manner.

ELECTRIC SMELTING OF IRON ORES IN SCANDINAVIA.

(*Concluded from page 235.*)

The Tinfos Furnace.—Apart from an experimental 5,000-H.P. Helfenstein furnace at Domnarvet, of which particulars are available, the only experience so far gained with this type of furnace is from the operation of small units at Notodden, so it cannot be said to have yet had the opportunities of development that have favoured the Elektrometall type.

The furnace is shown diagrammatically in fig. 1. The smelting chamber A is long and rectangular, having one carbon electrode, B, embedded at its base. There are three upper electrodes, C, and these are movable. The charge of ore, limestone, and coke is fed through the rectangular chutes *d*, *e*, extending right along the furnace. Two hollow water-cooled beams, F and G, support the roof and the chutes. The pig-iron and slag are tapped from one end.

Three-phase current is used to operate the three furnaces at Notodden, each taking about 1,600 H.P. at 35-55 volts, 50 cycles.

The arrangement by which the electrodes are in the middle and the supply of ore lateral is said to favour economy of heat. The furnace gases pass up the chutes, and help to heat the incoming material. For the rest, the gases could be utilised in other ways, but at present that is not done. An advantageous feature of the furnace is that it uses coke, and not charcoal, but coke containing 1·2 per cent. sulphur can be made to yield pig-iron with a content as low as 0·01 per cent. The furnace uses purer ores than the Elektrometall furnaces, and, the units being smaller, no useful comparisons can be made. In some tests recorded the consumption of energy in the furnace itself was 2,800 KW.-hours per ton of white pig-iron and about 3,000 per ton of grey pig, using a 44 per cent. ore.

The chief disadvantage of this type of furnace, compared with the Elektrometall, is that it uses single-phase current, so that on a three-phase circuit three furnaces have to be coupled together. On the other hand, the bottom electrode ensures all the current passing through the whole mass of molten iron, and the regulation of the height of the electrodes required in the three-phase Elektrometall, to ensure even distribution of current, is here unnecessary. The single-phase furnace has, however, the disadvantage of using a lower voltage, so that the losses in transmission and transformation are proportionally higher.

The Rennerfelt Furnace.—This is a new type of melting and refining furnace, invented in 1912. Up to the present, as many as some 20 furnaces have been built for Sweden, Norway, England and Russia, the largest having a capacity of 3 tons. It has been very successful in these small units, and the users are said to be most enthusiastic in regard to them. Mr. Rennerfelt hopes to be able to build units up to 50 tons capacity, or even more.

The furnace resembles the Stassano, in that it is of the "independent arc" type, but instead of the arc being merely reflected, or radiated down on to the charge, the arcs are so arranged as to be deflected themselves down upon the metal to be melted. The method is made clear from fig. 2, from which it will be seen that there are three electrodes, two horizontal and one vertical. They are supplied with two-phase current, the vertical electrode being the common return. The arc produced forms a flame extending vertically from the central electrode, and forced downwards by the magnetic force produced by the current itself. Fig. 2 also shows how the low-voltage two-phase current is transformed from high-voltage three-phase.

The furnace itself consists of a cylindrical steel shell, mounted on trunnions, so that it can be tilted. It is lined first with 1½-in. asbestos board, and then with fire-bricks, with an inner lining of magnesite bricks. Magnesite bricks line the roof, too, and thus a very high temperature can be maintained. The furnace's cavity is egg-shaped, as shown in fig. 3. In the larger furnace the cylinder is extended and several sets of arcs are used. A 40-ton furnace would have four sets of electrodes of 6 in. and 7 in. diameter. Graphitised electrodes are employed; they are smaller than amorphous carbon, so that the size of the openings is kept down. The consumption of electrode is only 3 kg. per ton of steel, and in the smallest furnaces the energy consumed does not exceed the moderate figure of 1,000 KW.-hours per ton of steel for castings. The power required for a 600-kg. furnace is 125 KW at 80 volts. For larger sizes it would decrease to about 120 KW per ton capacity. The furnace has been successfully used for melting ferro-manganese for use in Bessemer and open-hearth furnaces, as well as for melting steel for castings, which is its normal function.

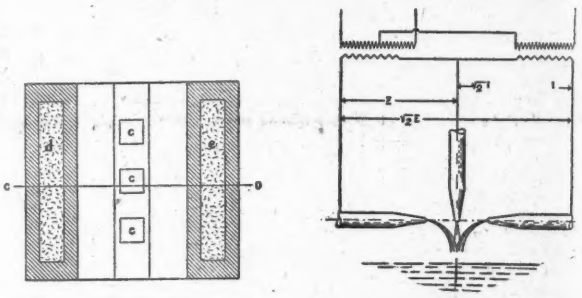


FIG. 2.

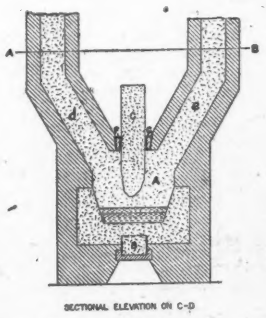


FIG. 1.—THE TINFOS FURNACE.

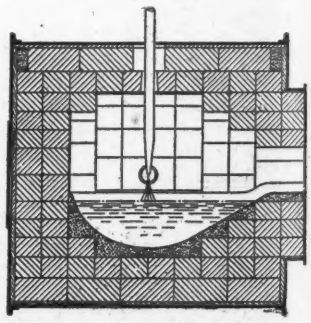


FIG. 3.—SECTION OF RENNERFELT FURNACE.

Conclusions.—Dr. Stansfield, from his study of Scandinavian conditions, arrives at the conclusion that although electric iron smelting cannot at present hope to compete generally with the blast furnace, in certain localities where pure iron, charcoal, and cheap water power can be obtained, it should be possible to produce economically a high-grade charcoal pig-iron, for the manufacture of special qualities of steel and wrought iron. Dr. Stansfield's interest is, of course, chiefly in Canada, and he points out that Canadian ores are not nearly so pure as Swedish ores. Nevertheless, impurities like sulphur are eliminated very thoroughly in the electric furnace, and it seems possible, so he concludes, using ores of moderate purity and a cheap fuel such as charred wood refuse or gas coke, that a good quality of iron suitable for car wheels could be made at a profit in one or other of the electric furnaces at present in use. This is more likely to be the case if a furnace such as the Elektrometall type were to do away with its shaft and its circulating system, and instead utilise the heat of its gases outside the furnace in heating open-hearth furnaces for turning the pig-iron into steel. It is noteworthy that the gas produced in making a ton of pig-iron in the electric furnace would almost suffice for the production of 1 ton of steel in the open-hearth furnace.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Triumph Hand Lamp.

We have received from Messrs. Ward & Goldstone, of Sampson Works, Salford, particulars of their Triumph electric hand lamp or torch, for which exceptionally long hours of burning are claimed. When fitted with the firm's "Volex Duo" dry battery, which measures 6½ in. long by 2½ in. wide, about 150 burning hours are obtained, using a 2½-volt metal lamp.

An accumulator giving the same burning hours would be much heavier and larger, and we understand that the "Volex Duo" dry

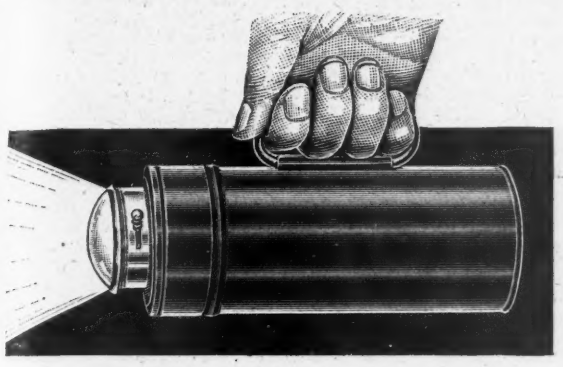


Fig. 1.—Triumph Electric Hand Lamp.

cell will hold up in stock for several years. On account of its long-burning hours, this lamp is recommended for use in factories, warehouses, &c., as a safeguard against the inconvenience of sudden extinction of the ordinary lighting.

The Arora Electric Fires.

The Arora Co., of Loughborough, which was started in the summer of 1915, marks a distinct advance in this branch of the electrical industry, under most propitious circumstances. Mr. Eric W. G. Burder, a keen member of the Loughborough Electricity Committee, who had an engineering works and foundry at his disposal, appreciated the great progress that electric heating and cooking was making; he met Mr. F. S. Grogan, who had patents pending, and possessed an exceptionally complete knowledge of what the public required, and their experience and resources were combined with the intention of providing, direct from the foundry, solidly built and reliable apparatus for heating and cooking at popular prices. The works extend over many acres on the outskirts of Loughborough, and have a private railway siding; goods can also be dispatched on two main railways, ensuring prompt delivery to all parts of England.

The "Arora" fires, one of which is illustrated herewith, are fitted with an element built of an extra-heavy section of wire, which under ordinary circumstances would not glow, but owing to the patented form of construction, a pleasing glow is obtained at

Fig. 2.—The "Arora" Electric Fire.

quite a low current density, and a maximum of radiant heat is produced. Elements of the most non-oxidisable metal have in the past oxidised sufficiently to reduce the consumption materially and consequently the heat produced. With the Arora heavy elements, this defect is reduced to a minimum. The elements are mounted on fire clay of exceptional strength. The frame-work is of cast iron throughout, in two main parts, the fire box and the front. The former is a complete unit forming a standard part, which is interchangeable with any front of the three finishes listed. It contains two 750-watt bars, two switches, and two heavy terminals complete with two yards of 70/36 S.W.G. flexible cord, and is attached to the front frames by means of two bolts only. The fire bars are also interchangeable, and may be obtained at a very low cost. The solid frame-work and parts are practically indestructible, and may at any time be made equal to new stock for a few shillings The total weight of the fire is 19 lb.

Arora fires Nos. 1, 2 and 3 (as illustrated in fig. 2) were put on the market in the middle of January this year, and we are informed that within a month orders were executed for over 40 corporations. Many repeat orders for large numbers have since been received, and strong approval has been expressed with regard to the particularly pleasing high-temperature effect and the remarkably low prices. We understand that Nos. 11, 12 and 13 are now coming through the works; they are similar to that illustrated, but 3 in. higher, to allow of the addition of a third fire bar. We also learn that very shortly a boiling plate of the open type will be put on the market, to meet the demands of the public and many central-station engineers for a quick, reliable boiler at low price.

Mr Grogan's many friends will be glad to hear of his new venture, and will join with us in wishing him success; few men have done more than he to develop the employment of electricity for cooking, and we believe he is working on the right lines—radiant heat and low prices.

Ediswan Dry Cells, &c.

We have received from the Edison & Swan United Electric Light Co., Ltd., of Ponders End, Middlesex, a sample of their Ediswan "O.K." dry cells, which they are making in their own works. The cell measures about 6 in. high and 2¼ in. in diameter; short-circuited through an ammeter for a moment, it gave 3½ amperes, and when put on discharge through a resistance of 5 ohms at 0·2 ampere, it stood up well to the heavy demand upon it, for nearly eight hours a day, four days in succession. During that period the output was 4 A.H., and the current had fallen to 0·12 ampere, but recovered to 0·15 after a rest. Later on, when short-circuited, it gave nearly one ampere for an hour and a half. So

Fig. 3.—"Ediswan" Shell-inspection Lamp Fitting.

far as we can judge from these rather haphazard tests, and the appearance of the cell, it ought to do good service in connection with bells, telephones, fire-alarms, &c.

We have also received from the company particulars of their "Ediswan" shell-inspection lamp fitting, which is provided with an earthing device, and is sent out wired complete with lamp holder, and three yards of 3-way flexible cord, the latter including the earthing wire. The fitting, which is shown in fig. 3, is extra strong, with a view to hard factory use, and is very cheap.

New Burglar and Fire Alarm.

Mr. Arthur Julian, of Bank Chambers, Reading, noticing whilst he was in the United States the remarkable frequency with which safes were dynamited by thieves, conceived the idea that a combination of a pneumatic and an electric alarm would form a considerable improvement upon the existing system (winding a great length of insulated wire round the safe, and keeping a current continuously flowing in the circuit, any interruption of the current giving an alarm). His plan is to include in the design of the safe a double lining of thin metal, either inside the walls and door or sandwiched between the plates of which the walls and door are built up, and to connect the cavity with a U-tube containing mercury and a platinum contact wire. The air in the cavity is under a slight compression, forcing the mercury out of contact with the platinum wire and the ends of a circuit containing a bell and battery are connected with the mercury and platinum. Under normal conditions, the circuit is kept open, thus avoiding the expensive renewal of batteries incurred with the closed-circuit system; variations of atmospheric temperature, if not negligible, can easily be compensated for. Should the air-pressure drop, owing to the wall or safe being drilled through or to other unlawful tampering with it, the mercury column at once would close the alarm circuit; the same result would follow if an accidental leak took place, the device, therefore, being self-testing. There is no difficulty in connecting the door of the safe to the alarm system. To guard against tampering with the pipe which connects the safe with the alarm apparatus, the inventor inserts into the tube three steel wires, which render it practically impossible to close the pipe by hammering, melting, or other means without allowing the air to escape and give the alarm.

Another application of the invention is to fire alarms. A system is already in operation in which a small-bore metal tube attached to a contact device is led round the ceiling of the room to be protected, the expansion of the air contained in it immediately giving warning of the outbreak of fire; Mr. Julian would put the air in this tube under slight pressure, so that the occurrence of a leak would instantly betray itself. In this case two platinum contacts would be required, one to announce a leak, the other to give an alarm in case of fire. He has also devised a burglar-proof bell to mount on the outside wall of a building in connection with a burglar alarm inside, the same principle being employed. Mr. Julian has patented the device in Great Britain and elsewhere,

and has provided for the apparatus being operated either on the plenum system, as above described, or on the vacuum system, which of course is an obvious alternative. We understand that he is open to negotiate with firms desirous of adopting the system.

Liquid Starting Switches and Controllers.

A novel type of throw-over automatic liquid starting switch has recently been invented and patented by Mr. J. H. Woolliscroft, A.M.I.E.E., general manager of Messrs. H. T. Boothroyd & Co., of Liverpool. One of the best-known types of liquid starter is the Woolliscroft automatic liquid drum starter and controller, which is in extensive use; the new arrangement, however, possesses distinct advantages even over this satisfactory instrument.

The new switch has been designed to start up automatically motors, &c., at a predetermined speed, irrespective of the manipulations of the operator, and can be justly termed "fool-proof." The

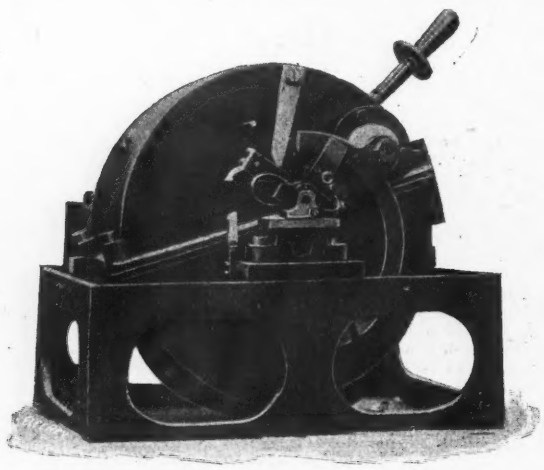


Fig. 4.—Starter in "Off" Position; Automatically Starting, and Held in Position with N.V. Coil.

device (fig. 4) consists of a circular drum divided axially, the halves being separated by a diaphragm, which is fitted with a two-way unbalanced valve. When the drum is rotated about 120°, it brings the electrodes to the bottom, the liquid being taken to the top and held suspended until it has leaked through the valve to the bottom half containing the electrodes. As the liquid is closing the path of resistance, the air in the electrode chamber, and the gases

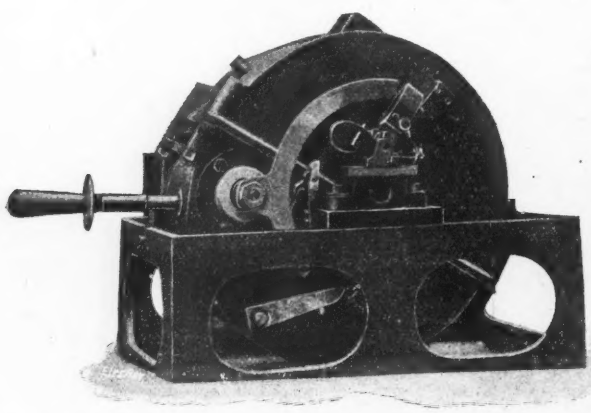


Fig. 5.—Starter in "On" Position; Automatically Short-circuited. Protective Covers are not shown in the Illustrations.

formed when starting up, are expelled through a special outlet vent, by the liquid acting as a water piston. Also to obviate any vacuum in the top half, from which the liquid descends, this chamber is fitted with a suitable intake vent hole. These vents are essential for practical working.

The switch is fitted with the usual no-volt and overload releases, and, being of the free-handle type, cannot be held in on a short circuit or overload. When the switch returns automatically to the off position, the liquid passes *en bloc* to the lower half without any disturbance or churning, and the air displaced passes unrestricted through the second valve arranged for the special purpose, which is part and parcel of the flap valve; the circuit is immediately opened, and the switch ready to be thrown over at once to the starting position again. This is a valuable feature, especially with reversing motors that require to be tickled rapidly in either direction of rotation. Another feature is that when the whole of the liquid has passed to the electrode chamber when starting up, the switch automatically short-circuits itself only after opening the electrode circuit and not merely shunting the paths as is usual, which latter method permits gases to be formed and electrolysis to take place, both of which are objectionable. The switch is short-circuited by the action of the two-way unbalanced valve, which when released from the weight of liquid, mechanically trips the contact brush to the short-circuited position with all resistance cut out (see fig. 5). With this arrangement there is not any waste or small currents passing continually, as is usual with solenoid-operated devices, &c.

Should any fault occur with any of the automatic devices (which is hardly possible), the starter can always be used as a plain dipper-type liquid switch, and can keep things going until opportunity occurs for inspection. The original type of Woolliscroft automatic liquid starting gears successfully got over the objection against the use of the early type of liquid starters (which were non-automatic and messy); the new pattern will be most useful for starting motors against heavy starting torque, doing away with expensive friction couplings, loose-belt arrangements, &c.

Being totally enclosed with the exception of the two small breathing or vent holes, which are effectually covered with fine gauze, the switches will fill the requirements for dusty, dangerous and explosive atmospheres.

Lead Melting Furnaces.

The Monometer Manufacturing Co., Ltd., of Whitehouse Street, Aston, Birmingham, has introduced a patent lead melting furnace, specially designed for the feeding of presses used in the manufacture of cable and compo pipe. Amongst the special features of the furnace are the automatic control of temperature by the firm's patent self-acting adjustable heat controller; the prevention of oxidation by turning the inert gases from the burners into the closed chamber covering the melting pot; the billet charging apparatus; telescopic outlet pipe; low-pressure burners fed from a gas equalising reservoir, &c.

Many of the leading cable makers use this furnace, and recently one firm has decided to equip its entire lead plant with a battery of these furnaces.

Electric Fire Pump.

Messrs. Mather & Platt, Ltd., of Park Works, Manchester, have recently issued a catalogue of fire fighting appliances, containing information to assist the shipowner to comply with the Merchant Shipping (Convention) Act, 1914, the provisions of which are about to come into operation.

It has been usual to install reciprocating steam pumps for fire duty, but Messrs. Mather & Platt draw attention to the possible alternative of an electrically-driven turbine pump, which has, comparatively, a greater output for its weight and size than the steam pump.

A two-chamber turbine pump running at 1,400 R.P.M., as supplied by the firm, will throw two jets horizontally about 60 ft., the water being supplied through 50 ft. of 2½-in. canvas hose with ⅝-in. nozzle. This absorbs about 23 H.P., and a motor of about 28 H.P. would be suitable for driving it. A motor-driven turbine pump of this type is illustrated in fig. 6.

Current would normally be drawn for the ship's lighting and power installation, but provision should be made for connection to the emergency set which is now usually carried on deck to permit of some amount of lighting being maintained and a supply given for wireless purposes, in the event of the main sets being put out of gear.

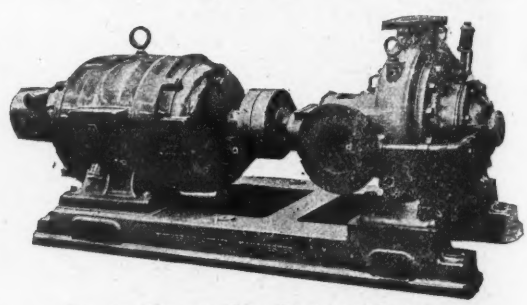


Fig. 6.—Turbine Fire Pump for Ships' use.

The Miner's "Scout."

This is a patent mechanical device, which is intended to indicate the slightest movement of ground, when adjusted in a stope or tunnel, and thus to give warning of impending falls of roof. Instant intimation is given to a watchman or to the mine manager's office by the completion of a circuit through the instrument; or the ringing of a bell and the showing of a red light on the device itself may serve, where the instrument is in sight of, or near, the miners. The Mining Commissioners in the South African Gold Mines, and also in Australia, state that there is need for such an instrument, and in the latter country legislation for its use in dangerous mines is about to be introduced.

The patentees are practical miners who have found the use of such an instrument of vital moment to them, as, in many mines in the countries mentioned, the number of accidents through falls of ground or rock exceeds 60 per cent. of the total. They claim that there is no sudden fall of ground without some slight movement some time before, and that this instrument indicates the slightest movement in time to enable the necessary measures to be taken to prevent accidents.

The instrument being inexpensive and of a portable nature, it can easily be carried and used in various parts of a mine. It is of very simple construction, consisting of two brass tubes telescoping together, but kept extended by a long spring inside them, and a box is fixed to the upper tube, containing a battery, bell and red lamp. Contacts on the outside of the box are closed when the tubes are pushed together, by a disk clamped on the lower tube. The outer ends of the tubes are shod with iron, and the instrument is applied by pushing the tubes together until they fit between the roof and floor of the tunnel, against which they are firmly held by the spring; the disk is then clamped close to the contacts, so that any movement of ground which brings the roof and floor nearer together by, say, ¼ in., or less if desired, will cause the bell to ring and the lamp to light up. Further information can be obtained from the SLOAN ELECTRICAL CO., LTD., of 12, Golden Lane, E.C.

"WIRELESS WIRING" AT THE FRONT.

THE following is an extract from a letter written by a G.E.C. man at the Front (Corporal Watts) to a friend in Walthamstow, Mr. F. Miller, who kindly forwarded it to us:—

"I must first of all ask you to thank all my pals at the G.E.C. for their kindness to me at Christmas. Indeed, it was good of you all to remember me and to express such kind wishes. The parcel arrived on the very day, but I couldn't say much then as my heart like my mouth was too full. I have never had such a Christmas, and, in many ways, I do not wish for another similar one. A week previous I was working hard for the review. We were successful in obtaining a large hall of a local woollen factory, and as it has only been built about two years it consisted only of the four walls (brick) and a cinder floor. We built a stage and arranged all the seating, and I took charge of the electric lighting. After a chat with the owner we persuaded him to supply us with current from his plant, so that was a great help. Well, I started in on what looked like an impossible job, as it was impossible to obtain any insulated wire or accessories from any of the large towns near. I then had a 'brain wave,' and collected two old inner tubes of a private car and a little rubber gas tubing. I commandeered some No. 8 bare copper wires and slung them across the river from the factory to the hall, insulating by pieces of inner tube nailed to woodwork. As I had no straining instruments, I took up the slack by forcing strips of wood between the leads. I brought the leads right outside the hall for safety's sake, and only brought them in on the stage. The next to tackle was

FIG. 1.

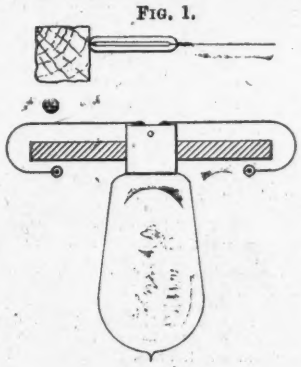


FIG. 2.

the hall, which I wired in bare No. 20 copper, which we had in stock as binding wire. As with the mains, the insulation was inner tube pieces, 1 in. × 1 in., under a wire staple. Where dead ends were attached rubber bands were cut and formed globe strain insulators. [Fig. 1].

"All wires were run on the top joists far overhead, so I made pendants with two live wires, separated by 6-in. strips of wood, and 6 in. of flex to enter the lampholder. This made a very satisfactory job, and at night was invisible by the artificial light. In fact, it was christened 'the wireless wiring.'

"Next I tackled the dressing-room, which was directly behind the stage, and as I was not allowed to cut a hole through the wall, I had to take my leads under the top of the door, which consisted of an iron girder, and was easily touched by the face of the artistes as they came off the stage—especially in 'black outs.' To safeguard this bend I ran the wires through two lengths of rubber gas tube, and labelled the position 'Danger à mort'—danger of death. The lighting of the dressing-room was carried out as the hall, but the leads were fixed to wooden brackets, and the drops were workshop flex. Next the stage. Now the fun started. I found I had used up all my holders and all I had scrounged from neighbouring columns. Here was a problem—how to bring the lamps into position of utility and out of the way of scene-shifters. Luck is a big factor, so I backed my fancy, and chanced it. My footlights and three lines of battens were all made by drilling holes to take the lamp-cap and soldering two pieces of wire to the contacts, and attaching them to the two leads stretched along the front of the batten by bringing the wires round to the front kept the lamp in position thus [Fig. 2]:—

"One of the staff-sergeants of our neighbours made two stage arcs for us, and they were a work of art. These I had to run for with $\frac{3}{20}$ insulated which was 'scrounged.'

"Now my total was made up as follows:—

Hall.	7 pendants (1 light); 1 cluster (5 lights).
Outside.	1 illuminated sign REVIEW. (2 lights).
Dressing Room.	6 pendants (1 light).
Orchestra.	2 pendants (1 light).
	1 signal light (1 light).
Stage.	2 projector arcs (10 amps.).
	18 footlights.
	56 battens.
	1 pilot lamp at switchboard, worked off accumulator, 4 volts, 8 C.P.

"Not a bad load, considering the voltage was 115 D.C. Now came the trouble of the switchboard. Here was a problem indeed. I had obtained 1 D.P. 10 amp., 1 S.P. 5-amp. knife, 3 5-amp. tumbler, 1 3-amp. tumbler, 1 dock plug, but no fuses. We made the board of 2 9-in. planks, 18 in. square, and mounted on two battens, 4 in. × 2 in. My fuse bridges were ¼ in. steel bolts (main, ⅜ in.) and bus-bars, copper wire bound zig-zag round the bolts. Fuse wire strand of No. 40 copper taken out of flax. Behind each fuse was fixed a piece of mica to prevent fire. With the help of Pte. W. Hossick, of the 18th A.S.P., who worked like the Scotsman he is, we were able to switch on half-an-hour before the dress rehearsal, to which were invited the invalids from the Hospital. As luck would have it, the only main fuses we could get on the switchboard in the mill were German cartridge type, and they only had one pair, 60 amps. You will see we were on the brink all the time, but, I am glad to say, all was well. My fuses were only just sufficient, as I dared not blow the cartridges. You can imagine what a relief it was to us electricians to see 'all on.' I won't say the fuses weren't warm—they were hot.

"Our dress rehearsal was Christmas Eve, and we had until Monday night to put the finishing touches, and we were at it to a packed house (average 800) every night of the week. Everything a great success. During the week of showing I had my ordinary work to do as well, so I was not idle. Three times that week I had to go up to the line to fix up a broken-down lorry. My part in the review was not hard, but I had to keep changing. One lot four times in 10 minutes. . . . . On the following Sunday we (A.S.C.) gave the kiddies of the village a bun-fight, cinema and concert. This entailed a lot of extra work as the mill was shut down, and I had to divide my lighting into halves and use two of our travelling workshops. On the following day we cleared everything away."

The occasion of the installation above described was the 5th and 18th A.S.P.'s Christmas, 1915, revue, entitled "Yes, I Think So!" The revue was written and produced by Private R. Douglas, assisted by Private L. Bartleet and Lance-Corporal Topham, while Private L. Bartleet arranged the music. The scenic effects were arranged by C.Q.M.S. Dearden, and the electricians were 5th A.S.P. Corporal Watts and 18th A.S.P. Private W. Hossick. The scenes were laid in "A Middle-Class English Home—Christmas, 1914," and "Grove Park Barracks—January, 1915," "Somewhere in England, July, 1915," and "Somewhere in France—Present Time." The last scene was as the first, but at Christmas, 1934; one scene was entitled, "Recruit's Dream—Horatio Tatus in Automobiling." Corporal Watts figured as a raw recruit, and "a lounger and policeman"—whether the last two parts were identical or not is left unstated. Corporal Watts was also responsible for a conjuring turn. The cast included many non-commissioned officers and privates, and one second lieutenant, who appeared in the *rôle* of "the dude." The entertainment appears to have been most carefully and ably planned and carried out, and illustrates the unquenchable good spirits and enterprise of our comrades in France.

A Substitute for Platinum.—An alloy for use in contact and spark devices to replace platinum has been patented by Mr. Paul R. Heyl, of New Rochelle, N.Y. (assigned to Commercial Research Co., of New York City). This alloy consists of silver and palladium, in varying proportions according to the conditions under which it is to be used. An alloy of silver with 2 per cent. of palladium has been found to give satisfactory results under many circumstances. When the contacts or spark points are exposed to sulphur compounds, 5 per cent. or more of palladium should be used. The alloy which was found to give the greatest resistance to spark erosion was that of 60 per cent. palladium and 40 per cent. silver. Additions of palladium to silver raise the melting point and lower the thermal conductivity. It has been found that, on account of the high thermal conductivity of silver, the heat from the spark will be conducted away fast enough to prevent melting of the silver. In view of this fact, silver-palladium alloys with very high percentages of silver can be used in a great many cases.—*Met. and Chem. Engineering.*

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

BRITISH INDIA.—A Customs Circular has been issued by the Department of Commerce and Industry fixing, with effect from January 1st, 1916, the tariff valuations on various articles imported into British India. These valuations differ in many instances from those which were previously in operation. The duty, however, on instruments, apparatus and appliances, and parts thereof—electric, electric lighting, galvanic, telegraphic and telephonic, remains the same, viz., 5 per cent. *ad valorem;* while electrical machinery and component parts thereof (including belting of all materials for driving machinery) remain free of duty. Among the articles for which the tariff valuations have been amended are the following, duty being charged at the rate of 5 per cent. in each case:—

	Former valuation.		New valuation.	
	Rs.	Ans.	Rs.	Ans.
Sal ammoniac ..... cwt.	31	0	36	0
Brass, patent or yellow metal, sheets and sheathing, weighing 1 lb. or above per sq. ft., and braziers and plates ..... cwt.	54	0	65	0
Copper, braziers, sheets, plates and sheathing ..... cwt.	62	0	65	0
Copper, pigs, tiles, ingots, cakes, bricks and slabs ..... cwt.	58	0	62	0
Copper, china, white, copperware ... lb.	2	2	2	4
Copper foil or dankpana, white, 10 in. to 11 in. by 4 in. to 5 in. ... 100 leaves	1	14	3	8
Ditto, ditto, coloured, 10 in. to 11 in. by 4 in. to 5 in. ..... 100 leaves	2	0	3	12
Quicksilver ..... lb.	1	8	3	0
Zinc or spelter, tiles or slabs, soft, cwt.	25	0	50	0
Zinc or spelter, tiles or slabs, hard, cwt.	20	0	40	0

16 annas = 1 rupee = 1s. 4d. (at par).

NORWAY.—Information has been received at the Board of Trade to the effect that the prohibition imposed in September last on the exportation of tool steel and turning steel from Norway has now been replaced by a prohibition on the exportation of tools and tool steel. The prohibition does not, however, apply to such articles produced in Norway and accompanied by certificate of origin.

UNITED STATES OF AMERICA.—A decision has been given by the Board of General Appraisers regarding the rate of import duty leviable under the United States Tariff Act of 1913 on power-transmitting tables for sewing machines. These tables, it is decided, being composed in chief value of metal, and capable of operating at the same time from 5 to 20 sewing machines, are properly dutiable as manufactures of metal not specially provided for, at the rate of 20 per cent. *ad. val.*

COLOMBIA.—A Colombian Decree of November 5th provides that when articles liable to Customs duty are sent to the Republic by ordinary or registered letter post, the same duty shall be levied thereon as if the articles were imported by parcels post (*i.e.*, the full duties prescribed by the Colombian Customs Tariff), and that, in addition, a fine of ½ peso shall be levied for each letter. Packets of books are, however, excepted from this provision, Customs duty only being levied thereon.

NEW PATENTS APPLIED FOR, 1916.

(NOT YET PUBLISHED).

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

2,164. "Telephone transmitter." H. Burge. February 14th.

2,176. "Electric switches or couplings." R. W. L. Phillips. February 14th.

2,179. "Electric torches or pocket lamps." A. A. King. February 14th.

2,201. "Systems for distributing electric energy." C. H. Wordingham. February 14th.

2,212. "Device for automatically effecting release of electrically-operated mine signals, &c." D. Pearse. February 15th.

2,243. "Telephonic receiver." A. Williams & L. D. Williams. February 15th.

2,244. "Electrically-operated intermittent motion in kinematograph apparatus, &c." A. C. Moll & A. D. Moll. February 15th.

2,249. "Passing through the human body currents derived from the ordinary town main electrical supply." E. E. Greville. February 15th.

2,253. "Automatic electric driving engine." F. Knight. February 15th.

2,254. "Method of electro-mechanically operating colour effects for theatres, &c." W. E. Grant. February 15th.

2,256. "Electric batteries." R. S. Baxter. February 15th.

2,261. "Regulation of induction motors." British Thomson-Houston Co., Ltd., & N. Shuttleworth. February 15th.

2,266. "Electrically-operated indicating apparatus for signalling apparatus on railways." J. P. O'Donnell. February 15th.

2,283. "Dynamo-electric machines." M-L Magneto Syndicate & E. A. Watson. February 15th.

2,287. "Electrical aids for deaf persons." C. W. Hawksley. February 15th.

2,293. "Electrical fire and burglar alarm." A. Julian. February 16th.

2,312. "Heavy current relay key." J. Gell. February 16th.

2,338. "Electrical discharge devices." S. Dushman. February 16th. (U.S.A., February 20th, 1915.)

2,329. "Means for producing alternating currents." British Thomson-Houston Co., Ltd. (General Electric Co., U.S.A.). February 16th.

2,339. "Telegraphy and apparatus therefor." A. C. Fuller. February 16th.

2,345. "Electric heat radiators." A. F. Berry. February 16th.

2,346. "Air purifying or conditioning apparatus." A. F. Berry. February 16th.

2,347. "Oil-cooled transformers." A. F. Berry. February 16th.

2,350. "Electric pocket lamps." F. E. Kuhn & A. Weinmann. February 16th.

2,375. "Combined plug, socket, and switch devices for electric circuits." V. Hope. February 17th.

2,384. "Accumulator-charging systems for vehicles." R. Russell. February 17th.

2,388. "Electro-magnetic apparatus." J. E. Pollak (Soc. Anon. des Etablissements L. Bleriot). February 17th.

2,400. "Electric buzzers, &c." A. W. Gamage, Ltd., & G. H. J. Horan. February 17th.

2,402. "Signalling by electro-magnetic waves." A. Artom. February 17th.

2,405. "Electric switches." C. W. Gray. February 17th.

2,443. "Fluid-operated electrical switches." J. F. Barr. February 18th.

2,444. "Electro-magnetic overload circuit breakers." H. E. Turney. February 18th.

2,464. "Electrostatic machines." Morris & Lister and D. K. Morris, and E. A. Watson. February 18th.

2,468. "Telephony." S. G. Brown. February 18th.

2,478. "Electric conductor grips for relieving the connection of such conductors with electric fittings from pulling strain." S. Fildes. February 19th.

2,491. "Electrical fuses or cut-outs." H. W. Cox. February 19th.

2,524. "Transforming motion into electrical waves or impulses." T. B. Dixon. February 19th. (U.S.A., July 19th, 1915.)

PUBLISHED SPECIFICATIONS.

1913.

20,856. Telephone Exchange Systems. Zivnostenska Banka (firm of). September 16th. (October 28th, 1912.)

1915.

1,087. Telephone Systems. J. E. Cooley. January 22nd. (January 23rd, 1914.)

1,435. Dynamo-electric Machines and Electrical Systems connected therewith. J. Stone & Co. and A. H. Darker. (January 28th.)

1,471. Automatic and Semi-automatic Telephone Systems. Relay Automatic Telephone Co. (formerly Betulander Automatic Telephone Co.) and L. C. Bygrave. January 29th.

1,500. Lamp Supports and Casings, particularly designed for use with Electric Incandescent Lamps. B. J. Grigsby. January 29th.

1,857. Submarine Electric Leakage Telegraphy. Signal G.m.b.H. February 5th. (February 5th, 1914. Addition to 13,919/13.)

2,078. Coin-freed Electric Illuminating Apparatus. H. F. Stiles and A. H. F. Perl. February 9th.

2,343. Telegraph or like Systems and apparatus therefor. Automatic Telephone Manufacturing Co. & S. R. Smith. February 13th.

2,624. Rotors of Dynamo-electric Machines. Sunderland Forge & Engineering Co., R. G. Scott and A. T. Robertson. February 18th.

2,687. Electric Batteries. J. Sutton & G. J. Sutton (trading as Stuart and Moore). February 19th.

3,442. Manufacture of Carbon Electrodes. Georg Mendheim (firm of). March 3rd. (March 4th, 1914.)

4,046. Electrical Switches. A. P. Lundberg, G. C. Lundberg, P. A. Lundberg, and G. Pegg. March 15th.

4,209. Rheostats. Igranic Electric Co. (Cutler-Hammer Manufacturing Co.). March 17th.

4,348. Telegraphy. Eastern Telegraph Co. & A. C. Gardiner. March 19th.

5,076. Electric Signalling Systems for use on Railways. J. Boot & W. E. Scourfield. April 1st.

5,224. Electrically-operated Reversing Mechanism for Planing Machines and the like. R. McK. Robertson & J. Lennox. April 7th.

5,261. Device for Testing the actual available Working Current in Electric Batteries or Cells. A. A. Lyon. April 7th.

5,513. Miners' Electric Safety Lamps. O. Oldham. April 12th.

5,768. Electric Lighting. I. Frankenburg & Sons, Ltd., and E. Fleming. April 17th.

6,807. Stereoscopic X-ray Apparatus. British Thomson-Houston Co. (General Electric Co., U.S.A.). May 6th.

6,898. Electrical Connectors. A. P. Lundberg, G. C. Lundberg, P. A. Lundberg & G. Pegg. May 8th.

7,006. Electrical Toasting Devices. E. C. R. Marks (Landers, Frary and Clark). May 10th.

7,433. Electric Air Heater. F. L. McKinnon. May 18th.

7,554. Combined Electric Switches and Plugs. A. H. Railing, C. C. Garrard & A. F. Searle. May 20th.

8,099. Means for adjusting the Height of Electric Lamps. R. E. Taifinder. June 1st.

9,915. Brake for Electrically-propelled Vehicles. Rt. Hon. H. L. Samuel, W. Slingo, H. C. Gunton & C. H. Douglas. July 7th. (Divided application on 15,539/14. January 28th, 1915.)

10,334. Electric Bells. M. Suwa. July 15th.

10,983. Method and Apparatus for Isochronising and Synchronising Rotatable Members, particularly applicable for Multiplex Telegraphy. P. M. Rainey. July 29th. (August 18th, 1914.)

11,375. Means for the Production of Sound by Electro-magnetically-operated Diaphragms. E. A. Graham. August 6th.

12,340. Electric Motor Control Systems. British Westinghouse Electric and Manufacturing Co. August 27th. (September 25th, 1914.)

13,837. Regulators for X-ray Bulbs and like apparatus. C. G. Roch. September 29th.

15,113. Dynamo-electric Machines adapted for Synchronous Working. L. J. Hunt & Sandycroft, Ltd. October 26th. (Addition to 24,838/14.)